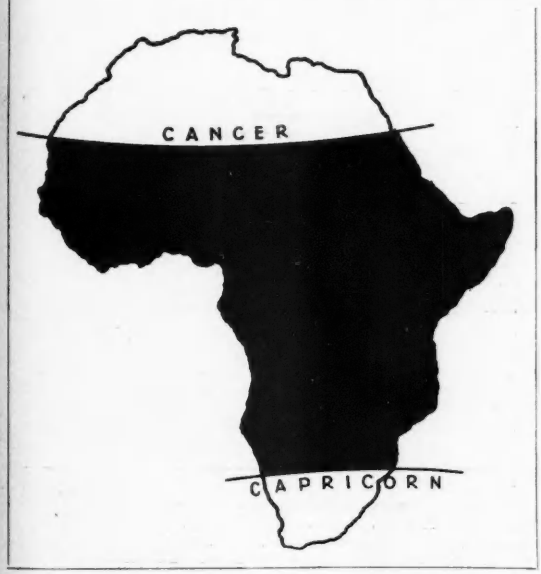
DISCOVERY

A Monthly Popular Journal of Knowledge

June 1936 One Shilling

TROPICAL AFRICA



(Continued on page liii).

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Notes of the Month.

Discovery issues its African number at a time when Africa is figuring prominently in the news. The first large scale political change within its boundaries since the War has just been brought about, and, perhaps not unnaturally, a certain amount of perturbation has arisen regarding possible repercussions on other parts of the continent. The control of one of the sources of the Nile by a new power is certainly a matter of importance; but a great many people have rushed into print concerning the Lake Tana problem without having duly considered the case. It has even been suggested that the waters of the Blue Nile might be diverted away from the Sudan, and consequently from Egypt. As an author of an article in this issue forcibly puts it, this would be about as practicable as diverting the Rhine from Basle across Switzerland into the Mediterranean. Moreover, the gorge of the Blue Nile, between Lake Tana and Roseires on the Sudan frontier, is practically unexplored and well nigh inaccessible. The hasty pundits would do well to examine the situation a little more thoroughly before giving expression to fears that cannot be other than groundless.

* * * *

At the same time, Africa is keeping up its classical reputation for providing surprises; and it is no doubt disturbing to the politicians to have their neatly-planned conception of the balance of power rudely shattered by an interfering nation. Discovery readers will find more satisfaction in hearing of progress made in various branches of African knowledge. The importation of stingless bees into this country from Matabeleland has been followed by the discovery of a new species of fly in East Africa; and excavations in Egypt have led to some remarkable finds, including what is almost certainly the earliest mummy of a horse, dating from the XVIII Dynasty. Further work at the familiar sites of Sakkara and Giza has been surprisingly productive in new knowledge of the I and IV Dynasties. Meanwhile, study among the indigenous races of Africa has been proceeding, and Dr. Seligman sums up the present position in the first article of this issue. The most urgent aspect of the native question in Africa to-day, however, is social rather than anthropological.

* * * *

No little wisdom has been shown by the Government in South Africa in allowing little delay to intervene between the highly controversial abolition of the Cape Franchise and the introduction in the Union Parliament of a Bill dealing with native lands. In depriving that part of the native population, which had had the right to vote for representation in Parliament, of their long standing privilege, the party responsible inevitably laid itself open to the imputation of racial prejudice; but as was pointed out by General Hertzog at the end of April the provisions of the Bill are "an earnest of the Government's sincerity in dealing sympathetically with native needs." It is, in fact, a measure which will implement an undertaking too long outstanding.

* * * *

The native reserves, it is generally admitted, are inadequate, and this is the cause of much of the present unrest. This inadequacy is due, in part, to increase of population, in part to native custom, which identifying wealth with the holding of cattle, leads to overstocking, and, through overgrazing, to impoverishment of the

soil, erosion and other consequences of a serious character. Yet no attempt to enforce a reduction in the number of cattle would be tolerated by native sentiment. It is now proposed to add some 14 million acres to the existing holding in the reserves of 20 million acres. A trust is to be created under the administration of the Governor General, in which the ownership of all native reserves will be vested. The purchase of the additional land is to be spread over five years and £10,000,000 to be provided to meet the cost. The Bill deals also with arrangements affecting natives on lands ouside the reserves. Native squatting on European-owned land, a frequent source of trouble and abuse, is forbidden; while in future all labour tenants are to be registered.

* * * *

Readers are reminded that the annual meeting of the British Association will be held this year in Blackpool, from September 9th to 16th, with Sir Josiah Stamp as president. At the inaugural general meeting Sir Josiah Stamp will deliver the presidential address, dealing with the impact of Science on Society. On the evening of September 10th a reception will be held by the Mayor and Mayoress of Blackpool in the Winter Gardens. The first evening discourse will be delivered by Mr. C. C. Paterson, who will speak on science and electric lighting, a subject of vital interest to Blackpool. The second evening discourse, by Captain F. Kingdon Ward, will deal with plant-hunting and exploration in Tibet. One aim of the Association, prescribed in its first Statute, is "to obtain more general attention for the objects of Science, and the removal of any disadvantages of a public kind which impede its progress." In order to help fulfil this aim, a series of papers, stressing the points of more immediate public welfare, have been grouped together in a series. Six of the presidential addresses are included in this series, as well as many of the other papers.

* * * *

Cambridge University is the lucky recipient of one of the most important gifts from Industry to Science in recent years. Sir Herbert Austin, the motor manufacturer, has made the munificent donation of £250,000 to the University for scientific research, in appreciation of "the very valuable work done by Lord Rutherford and his colleagues." Sir Herbert adverted to the contrast between the funds available for scientific research in this country and the United States, and referred particularly to the handicap under which the Cavendish Laboratory had been labouring as compared with kindred institutions in America. The gift was gratefully accepted by Mr. Baldwin, Chancellor of the University, and Lord Rutherford has already announced that the first used of the money will be to construct and equip a High Voltage Laboratory, in order to facilitate the carrying out experiments on the transmutation of matter.

* * * *

THE encyclopædic knowledge and true internationalism of that great benefactor of learning, Sir Robert Mond, have been gracefully acknowledged by the French Government with the award of a Commandership of the Legion of Honour. The insignia of the rank were conferred upon Sir Robert by Professor Auguste Béhal in the *Maison de la Chimie*, the recently founded Chemical Institute in Paris which Sir Robert has done so much to encourage. In view of the recipient's connection with the chemical industry, the site was appropriate; but appropriate also was the acknowledgment of his distinguished work in other branches of learning. M. Paul Lemoine, Director of the Natural History Museum of Paris, referred to his work on behalf of marine biology by the foundation of the *Musée de la Mer* at Dinard; and M. Dussaud, Keeper of Oriental Antiquites at the Louvre, spoke of his generous assistance to Egyptian excavation, notably to the work in the Necropolis at Thebes. In expressing his thanks, Sir Robert made characteristically slight reference to his own work, and while admitting our debt to workers of the past, laid special stress on the duty of the coming generations to keep on building the edifice of knowledge, and on his confidence that they would carry on the task.

* * * *

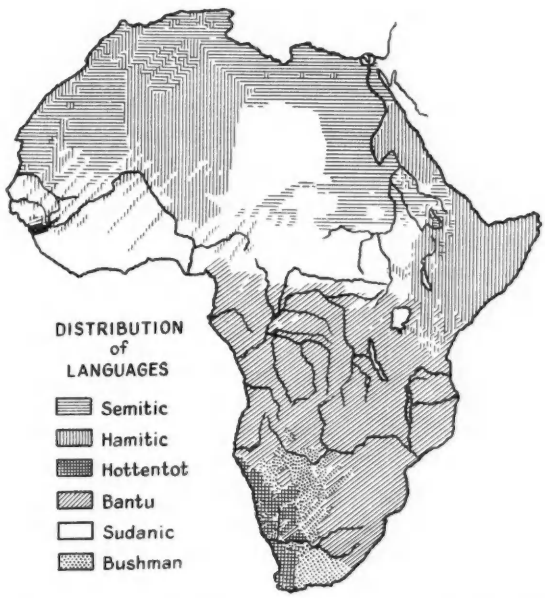
During last month the Carnegie United Kingdom Trust published its *22nd Annual Report*, which covers the year in which the centenary of the birth of Andrew Carnegie, founder of the trust, was celebrated. Among the multifarious benefactions of the trust in 1935 two stand out from the others as marking new lines of policy. A very important allocation of funds for the period 1936-40 is to be devoted to Land Settlement, especially co-operative smallholding schemes; while the second new cause to be benefited is that of Amateur Music. The Trustees felt that, with the formation of the National Federation of Music Societies (on a strictly amateur basis), an opportunity was presented them of furthering the appreciation of music over a widespread national field. Libraries and Adult Education have benefited as usual, and new grants to Museums have been made to enable curators to add to their experience by visiting other museums, at home and abroad.

Human Types in Tropical Africa.

By C. G. Seligman, M.D., F.R.S.

Scientific and popular opinion agree in regarding the Negro as typical of Tropical Africa. But the usual notion that Negroes are the only natives of that region is very far from the truth. Dr. Seligman shows how the impact of peoples of the Caucasian race upon the Negro has modified the population of the Continent; an interesting point is that—unlike in Europe—linguistic divisions are a very fair indication of ethnic groups.

TROPICAL Africa can be defined only on cartographical lines, for its vast extent is not limited either north or south by any natural geographical feature, with the possible exception of the First Cataract of the Nile, which is only a few miles north of the boundary of the tropic of Cancer at 23½° North. The northern part of this tropic lies so far south of the great majority of Berber peoples that they may reasonably be excluded from this survey. In the South the limiting line (23¾°S.) of the tropic of Capricorn traverses an area inhabited by Bantu, Hottentots, and Bushmen all extending northwards into the southern tropic. It should be added that, broadly speaking, Africa is flat, with plateau lands (it has been compared to an inverted soup plate), the barriers to communication between its peoples being desert and forest, not mountains, except possibly in Abyssinia. The result is that over the greater part of the continent there are fewer obstacles to the mixture of peoples than in any other land area of equal size. It is thus not surprising that the generally accepted ethnology of Africa, apart from the delimitation of the great racial groups of the continent, has to a great extent been based on linguistic criteria, for though they are in themselves no safe guide to race, the facts of language are relatively easily determined and the distribution of language families in Africa so substantially corresponds to ethnic reality that many terms such as "Hamite," "Semite," "Bantu," etc., which strictly speaking have no more than a linguistic significance, are habitually employed with a high degree of ethnic accuracy. Moreover, language is to most people so much more interesting than physical anthropology, besides requiring a less uncommon training, that very much more is known of African linguistics than of African physical anthropology. The sketch-map herewith (from Professor Bernard Struck) shows the distribution of the great language groups of Africa, which, as already stated, closely corresponds with ethnic distribution.



Map showing the distribution of language-families in Africa.

The great divisions of mankind inhabiting Africa are as follows:—

1. Hamites and Semites belonging to the White (Caucasian) race or subspecies of *Homo sapiens*.*

2. Negroes, constituting one of the primary races or subspecies of *Homo sapiens*.

3. Negritos, a pygmy, infantilistic, dark-skinned type, related (though we do not know precisely how) to the Negro.

4. Bushmen, yellow-skinned, with somewhat oblique eyes and hair resembling that of the Negro. With them we may class the Hottentots, since the latter have arisen from a mixture of Bushman and Hamite with perhaps a certain amount of Negro admixture.

Negritos and Bushmen are nomadic hunters, the former perhaps holding their own in the forests of Equatoria, the latter a rapidly perishing stock of the

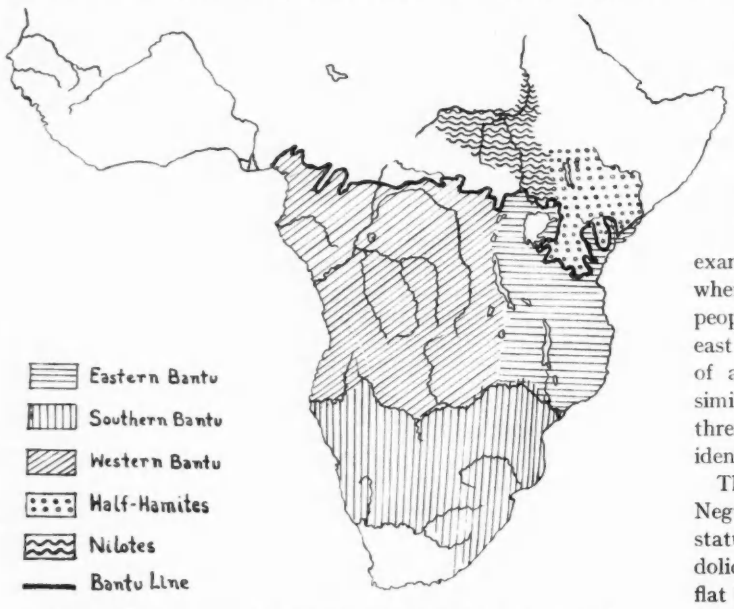
* In 1911 Elliot Smith suggested the term "brown race" for the peoples of proto-Egyptian type, i.e., the Mediterraneans of Sergi, and for a number of people, or an element in the population, of lands outside Sergi's area—including the inhabitants of Southern Persia, Mesopotamia, and some coastal parts of Asia Minor (*The Ancient Egyptians*, 1923).

South African grasslands. There is evidence that both types once extended far north of their present habitat, but though of vast interest to the anthropologist they have taken no discernible part in the racial history of Africa, which is in the main the result of the mutual interactions of Hamite and Negro and of the mixed stocks to which these gave rise (the Semites—apart from Phœnicians and Carthaginians, and early colonisers of Abyssinia—have been present in Africa for scarcely more than a thousand years). That the cultural advances of African peoples are in the main due to Hamitic influence is true, whether this influence was exerted by the highly civilised Egyptians or by such wilder pastoralists as are represented at the present day by the Beja and Somali of East Africa. The importance of the Hamites and the part they have played in Africa will be realised by reference to our linguistic map, when it will be seen that Hamitic languages are spoken over perhaps one-fifth of the continent. The area inhabited by people regarded as of Hamitic origin is even larger, including, as it does, many tribes superficially semiticised through the influences of Islam, and before the Arab expansion Hamitic-speaking peoples must have occupied by far the greater part of the northern half of Africa. At the present day the northern portion of Africa is essentially white or light-skinned, inhabited by Caucasian Hamites and Semites ; the southern essentially Negroid. The northern boundary of the latter zone may be defined with fair precision by a line drawn north from the mouth of the Senegal River, through Timbuctoo to Khartoum, thence southward and westward to the Abyssinian border at about 12°N., and following the Abyssinian border to the Juba River and Indian Ocean. All to the south of this line is Negro or predominantly Negroid, with peoples almost everywhere characterised by their dark skin and woolly hair.

The Negro, whom we rightly regard as typifying Africa, is no doubt one of the oldest stocks of that continent. Although no Negro skulls of great age have yet been discovered, the Archæological Survey of Nubia has brought to light a burial, with typical negro hair, dating to the Middle Kingdom (about 2000 B.C.), while the antiquity of the race is indicated by one of the great proto-Egyptian slate palettes, dating from the latter half of the fourth millennium B.C., which depicts captives and dead with woolly or frizzly hair and showing the same peculiar form of circumcision as is now practised by the Masai and other negroid tribes of Kenya Colony. It is therefore obvious that not only were there Negroes in Africa more than 5,000 years ago, but that the mixture of Negro and Hamite had begun even earlier, a fact which warns us when discussing Negro Africa to bear in mind the differences between the true Negro and the many dark-skinned Negro-Hamitic peoples that have come into being.

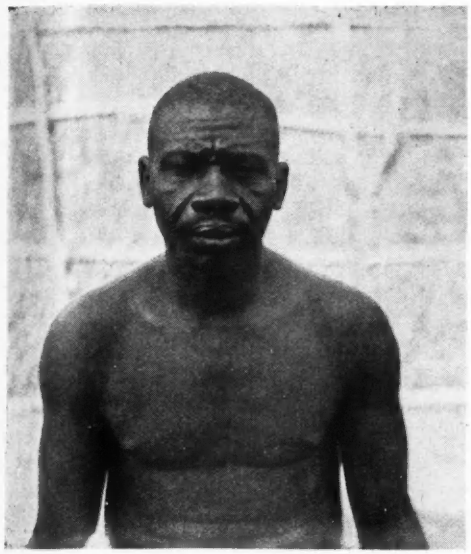
At the present day the home of the true Negro is in West Africa, the area of tropical rain forest, and may be regarded as extending from the mouth of the Senegal River, about 16°N., to the eastern boundary of Nigeria, its eastern boundary coinciding with the northernmost limits of the Bantu along the lower course of the Rio del Rey. Within this area are included a large number of important tribal groups, speaking a variety of languages, though all belong to the Sudanic language family. An example is furnished by the Guinea coast, where the Twi-, Ewe-, and Yoruba-speaking peoples succeed each other from west to east ; each of these linguistic groups consists of a number of tribes with more or less similar customs, while the members of all three groups themselves exhibit a substantial identity in their basic beliefs and habits of life

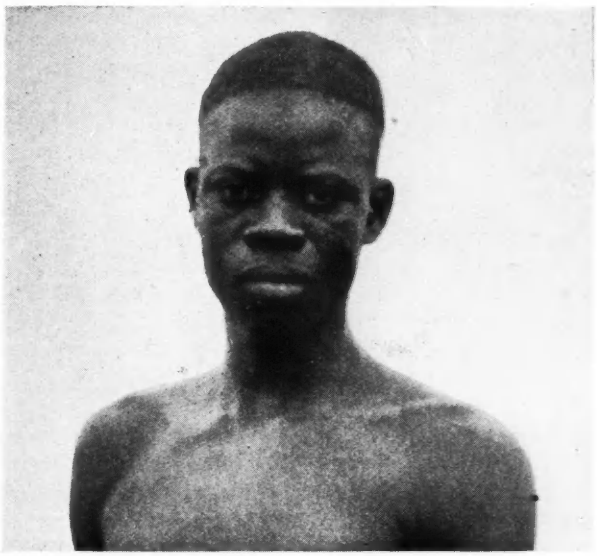
The main physical characters of the true Negro are a black skin, woolly hair, a tall stature averaging about 68 inches, moderate dolichocephaly (mean cephalic index 74-75), flat broad nose, thick often everted lips, and frequently a considerable degree of prognathism. Of the two Negro types here illustrated,



Distribution of the chief mixed Negro-Hamitic tribes (*p.* 170).

[*From "Races of Africa," The Home University Library*





Left: Native of the eastern Belgian Congo. Right: Talenssi tribesman of the Gold Coast, more typically West African.

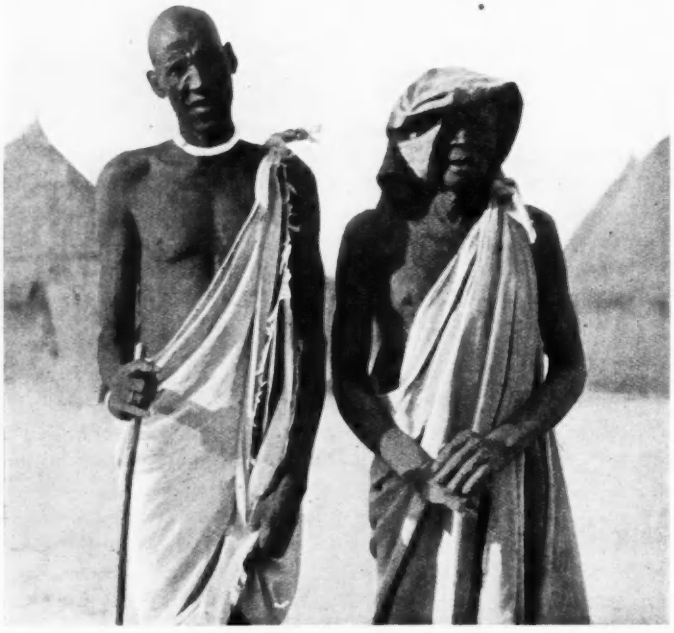
that on the left represents a native of the eastern portion of the Belgian Congo with most of these features well developed, while the other (for which the author is indebted to Dr. M. Fortes) represents a Talenssi tribesman of the Gold Coast, more typically West African in appearance. Culturally, the Negro possesses some characteristic features, including gable-roofed huts, bows tapering at each end, with bow-strings of vegetable products, swords, plaited shields (but not clubs or slings), and among musical instruments a peculiar form of guitar—the so-called West African harp. Clothing is of bark-cloth and palm fibre, not of skin; secret societies, masks, and wood-carvings of the human figure are characteristic, while coiled basketry does not occur. Essentially cultivators, they have no cattle. Cannibalism exists, and human sacrifice was common and might attain a huge scale, as in Ashanti. Circumcision and the knocking out of the upper incisors are practised sporadically over a wide area.

On the artistic side the West African Negro shows a skill in plastic art that is hardly found elsewhere in Africa, the carved ivories, wooden and ivory masks, and bronzes of Benin being especially noteworthy. Here, on the capture of the city in 1897, were found many carved elephant tusks, and bronzes cast by the *cire perdue* process, including some, such as the well-known bronze head of a young Negress in the British Museum, showing high artistic feeling and great technical skill. The finest of these are to be assigned to the 16th century and though undoubtedly negro in execution, many show European, i.e., Portuguese, influence, for instance, bronze plaques portraying Europeans or Negroes with guns, while some of the ivories can only represent objects of European origin.

So far we have dealt with the true West African Negro, but besides these there are groups of black-skinned, woolly-haired people who, although differing from the true Negro, show considerable resemblance to the latter culturally and physically. The Nuba of southern Kordofan are such a group. It does not appear that they have originated from a mixture of Hamites and Negro, though the true Nuba of southern Kordofan speak a language that has been termed Bantoid, i.e., one that has an alliterative concordance (see below) and perhaps an approach to noun classes. Physically these Nuba are tall and long-headed with an average cephalic index of 76 to 77, but somewhat north of this area groups showing a general resemblance in physique and culture exist who are distinctly more round-headed. If we regard all these Nuba as more or less modified representatives of a single stock it is possible to suggest their extension westward as a zone of black hillmen reaching to the Northern Provinces of Nigeria and the Northern Territories of the Gold Coast. There are, moreover, suggestive cultural resemblances; it is probably no accident that the cicatrisation of some of the Nuba women of southern Kordofan, the quartz ornaments they wear in their lower lip, and the unusual structure of their houses, can be closely paralleled in these western areas. Southward they are perhaps to be related, though more distantly, to some of the more round-headed stocks of the Congo and the extreme west of

the Anglo-Egyptian Sudan. The Hamites are commonly divided into two great branches, Northern and Eastern. The Northern Hamites, best represented by the Berbers of Algeria and Morocco, are outside the geographical limits of this article. The Eastern Hamites, besides the ancient and modern Egyptians (also outside our geographical limits) comprise the Beja of the Red Sea Province of the Sudan, the Nubians (not to be confused with the Nuba of Kordofan), the Galla, the Somali and Danakil, while the Abyssinians—essentially Hamitic in origin—are nowadays much mixed with Semites and Negroes.

As pointed out by Sergi, there is naturally much variation within such wide-flung groups. Nevertheless, certain general tendencies can be distinguished in cranial and facial characters. The Hamite is for the most part long-headed, with straight nose—or aquiline, where there is an infusion of Armenoid blood. Where there is no Negro admixture, the face is not prognathous; though the lips may be thick, the hair is never woolly, and is often almost straight, or wavy. Apart from miscegenation the skin is not black, but yellowish-brown or red-brown. On page 171 is shown a group of Beja from the Red Sea Province of the Anglo-Egyptian Sudan.



Contrasting types of Shilluk.

[*From "Pagan Tribes of the Nilotic Sudan," by courtesy of Messrs. Routledge.*

The Hamitic cradleland is generally regarded as Asiatic, but they certainly reached Africa at an early date, since the predynastic Egyptians, who were perhaps the purest Hamites we know of, go back at least some six thousand years. Within our area the early Nubians were of the predynastic type, and at the present day the Beni Amer of the southern Sudan and Eritrea reproduce the type with astounding fidelity. As an example of the persistence of type, the following table (taken from the author's *Races of Africa*) is worth reproducing:—

	Cranial Index	*Stature.*
Bisharin (Hill)	74·7	66½ in.
Beni Amer	74·7	64½ „
Proto (Predynastic) Egyptians*	74·9	64 in.

As already stated, the greater part of Negro Africa is occupied by Negroes hamiticised to varying degrees. The origin of these Negro-Hamitic peoples will be understood when it is realised that the incoming pastoral Hamites arrived in a long succession of invasions, perhaps dating back many thousands of years. Of sterner temper—if we may judge by their modern representatives—and in later times presumably better armed than the agricultural Negroes among whom they settled, they would soon assert their superiority over the latter. There was no Bronze Age in Africa, and the Negro, now an excellent iron worker, presumably learnt this art from the Hamites, i.e., almost certainly from the Egyptians. Gradually, as a result of the invasions, a series of peoples of mixed Negro and Hamitic blood arose; these would be regarded with disdain by the next incoming wave of Hamites and be pushed farther inland to play the part of an invading aristocracy *vis-à-vis* the Negroes on whom they impinged. This process was repeated over a long period of time, the pastoralists always dominating the agriculturalists, who tended to leave their mode of life in favour of pastoralism or to combine the two. The result of one such series of combinations is to be seen in the Zulu, another in the Baganda, while an even more striking example is afforded by the symbiosis—to use a biological term—of the Bahima and the Bahero. The Bahima, a tall cattle-owning aristocracy with narrow noses and long faces

* The index of the proto-Egyptian has been increased by two units to make it comparable with those of the Bisharin and Beni Amer taken on the living subject.

(though they always have negro hair), are utterly unlike the shorter, broader-faced negro Bahero in whose country they live and who normally provide them with grain. It is probably true to say that wherever cattle play any considerable part in the life of the people we may accept this as evidence of Hamitic influence, and commonly of the presence of Hamitic blood. Cattle are indeed the outstanding cultural feature of the Hamites, and have been taken over by the majority of mixed Negro-Hamites and by the Hottentots (of mixed Bushman and Hamitic origin). Other cultural features of the Hamites are round shields (soon lost among tribes of mixed blood), head-rests of a particular type (very persistent) and coiled basketry; decorative motives on property are minimal, and carvings of the human figure are unknown. Cannibalism is almost entirely absent.

Classification of the many mixed Negro-Hamitic groups is difficult, and once more our terminology is based on the relatively easily determined facts of language, though recent investigation again shows a fair correspondence between language and physical characters.

The following may be regarded as the primary divisions of Negro-Hamites :—

1. The Nilotes of the Nile Valley, speaking Negro (Sudanic) languages and extending from the Anglo-Egyptian Sudan some 200 miles south of Khartum into Uganda.

2. The Nilo-Hamites (a bad name, since there is nothing to show that the peoples to whom it is applied are a mixture of Nilote and Hamite), speaking Hamitic languages and inhabiting East Africa and East Central Africa from the neighbourhood of Lake Rudolph in Kenya to 5° or 6° S. in Tanganyika Territory. Many of these tribes are perhaps better grouped under the term half-Hamite.

3. The Bantu, occupying the southern two-thirds of black Africa, i.e., that part of the continent south of a line running irregularly from the Rio del Rey to the mouth of the Juba River.

The Proud Nilotes.

The first great group of hamiticised Negroes, the Nilotes, constitute a well-defined physical type. They are tall dolichocephals with very dark skin, speak Sudanic languages, and are associated with a developed cattle culture. They occupy the Nile Valley from some 200 miles south of Khartum to Lake Kioga, one group reaching Lake Victoria. The majority of Shilluk—who, with the Dinka, may be taken as the most typical representatives of the Nilotes—are obviously Negroid rather than Negro, while in spite of their dark skins and

A group of Beja, a Hamitic tribe from the Red Sea Province of the Sudan.

preponderantly Negro blood the Nilotes are culturally far more Hamitic than Negro, their predominant pastoralism being reflected in the almost religious esteem in which they hold their cattle. Human sacrifice is very rare and cannibalism unknown, in contradistinction to many of the tribes on the other side of the Nile-Congo divide. The men for the most part go naked, the women commonly wear leather petticoats. Psychically the Nilotes show an aloofness and pride of race, with a lack of desire for European clothes or trade objects, which is probably unparalleled elsewhere in Africa.

Many of the Nilo-Hamites carry definitely more Hamitic blood than the Bantu and Nilotes, the relative preponderance of the Hamitic side of their ancestry being reflected alike in speech, appearance, and culture. They all speak languages of Hamitic type, and although dark-skinned (but generally not so dark as the Nilotes) their faces are generally Negroid rather than Negro. Culturally they are predominantly pastoralists, many of their tribes leading the semi-nomadic life which this entails. The Nandi, Masai, Turkana, and Suk are perhaps the best-known tribes of this group.

The Bantu are a congeries of peoples, generally considered to have originated in the neighbourhood of the Great Lakes. They are named from and defined not by physical characters, but by the peculiar type of language they speak. Apart from the nations grouped round the shores of the Great Lakes (Baganda, Bakitara, etc.), where the Hamitic invaders have mingled less completely with the older inhabitants, the infusion of Hamitic blood which differentiates the Bantu from the pure Negro is strongest in the east and south, weakest in the west and north, but whether any particular tribe carries more or fewer Negro or Hamitic genes, it is regarded as Bantu

if it speaks a language characterised by a division of nouns into classes distinguished by their prefixes (usually 12 to 15), the absence of grammatical sex-gender, and the existence of alliterative concord. By this is meant that the prefix of each class (noun-class) is repeated in some form in all words agreeing with any noun of that class in the sentence, the re-appearance of the prefix in every word in agreement with the noun giving the alliterative effect; this is illustrated by the following Zulu sentence (singular and plural), taken from the late Professor A. Werner's *Language Families of Africa*:—

Umu-ntu w-etu omu-hle u-ya-bonakala si-m[u]-tanda

Man our handsome he appears we him love

Umu is the singular prefix of the class to which the word *ntu*, man, belongs, the plural prefix being *aba*, so that in the plural the sentence just given will run:

Aba-ntu b-etu aba- hle ba-ya-bonakala si-ba-tanda

People our handsome they appear we them love.

Even more simply the Bantu might be defined as all those "blacks" who use some form of the root *ntu* for human beings; with the plural prefix this becomes *ba-Ntu* (Bantu), i.e., "the men (of the tribe)," whence the term under which the whole great group has passed into anthropological literature.

The Main Bantu Divisions.

They may be subdivided into three main groups: Southern Bantu, inhabiting the vast region south of the Zambesi and Kunene Rivers; Western Bantu, reaching from the Kunene River in the south to the Rio del Rey (separating southern Nigeria from the Cameroons) in the north, and from the Atlantic to the Rift Valley (line of the Great Lakes) in the east; Eastern Bantu, stretching from Uganda to the Zambesi.

The Southern Bantu comprise the Shona peoples, the Xulu-Xosa (including the so-called "Kaffirs," and the Matabele), the Suto-Chawana (Bechwana, Basuto, etc.), and the Herero-Ovambo; they are grouped into a very large number of tribes showing great physical diversity.

The area of the Western Bantu includes the true "Heart of Africa," the tropical rain forest of the Congo, the home of the Negrito pygmy hunters, and in the west such renowned cannibals as the Fang; it also includes the territory of considerable and highly organised kingdoms, such as the medieval kingdoms of the Kongo and the Balunda, and the later Bushongo Empire.

Of the Eastern Bantu, the Lacustrine tribes appear to present a more recent Hamitic element than that which originally gave rise to the Bantu; indeed among the Banyankole assimilation between the two stocks has scarcely gone beyond the possession of a common language, spoken alike by the intruding Bahima and the indigenous Bahero. The social organisation of the Lacustrine tribes is essentially aristocratic, and ceremonial life centres round the king; on the other hand, such well-known tribes as the Akamba and the Akikuyu strictly speaking have no chief, but government is in the hands of a council of elders with only local authority and a man's position in the community is determined by the seniority of his age-grade. The Bantu Wachagga on Kilimanjaro share with the non-Bantu Lotuko of the Nile Valley the custom of exhuming the bones of their dead after some months, the skull being then taken to an ancestral shrine or deposited in an earthen jar in the neighbourhood of the village. The Swahili of the east coast are specially important, as their language has become the *lingua franca* of a great part of East Africa.

Finally a word about the Semites. In Africa the term "Arab" is commonly applied to any people professing Islam, however much Negro, Hamitic, or other foreign blood may run in their veins, so that however great its cultural value the name is of little ethnic significance and often is frankly misleading. The purer Arab tribes, even those of northern Kordofan, cannot be considered in this article; it should, however, be realised that in Darfur and extending westwards into French Military Territory there are many tribes of mixed Negro-Arab culture and probably of Negro-Hamitic-Arab blood, while in the southern part of the Anglo-Egyptian Sudan live such Negro-Arab tribes as the cattle Arabs (Baqqara) of southern Kordofan, whose members furnished the Mahdi with many of his fiercest warriors—indeed his successor, the Khalifa, was himself a member of the Ta'aisha, one of the Baqqara tribes.

"Punch" at the Zoo.

THE *Report of the Zoological Society of London* for 1935 is as usual an interesting and informative document, but to the zoologist it would at first reading seem to offer little scope for humorous treatment. But, with a trifle of detachment, it is possible to see that what is a perfectly ordinary statement to the zoologist may be distinctly odd to the layman. This oddness has been genially exploited in *Punch* by an author who can scarcely hope to preserve anonymity under the tenuous disguise of his initials, E.V.L. Beneath his skilful touch, Bosman's Potto undoubtedly emerges as the possessor of an outlandish name; and it is seen to be a matter for wonder that donors should have presented a Slow-worm, a Dourocouli, or twenty Salamanders. It is a little exacting of E.V.L., however, to exclaim at the designation "Common" Heron; even zoologists cannot be expected to call the bird the "Relatively Common" Heron, which is all that its title signifies.

A Study of the Upper Nile.

By H. E. Hurst, C.M.G., M.A., D.Sc.,

Director-General, Physical Department, Egypt.

Political changes in Abyssinia have brought the question of the Nile into prominence. How the flow of the upper waters of the mighty river can affect the prosperity, even the life, of Egypt, is the theme of this authoritative survey of the river's sources of supply.

OVER 4,000 miles from the sea as the river flows and nearer to the Cape than to Cairo lie the most remote sources of the historic river Nile which includes within its basin a wonderful variety of scenery, vegetation and climate, ranging from the monotonous plains of the Central Sudan to the volcanic peaks of the Mufumbiro Range, from the scanty herbage of the arid desert to the luxuriant foliage of the tropical rain forest and from the scorching summer heat of the Northern Sudan to the cold of the perpetual snows on the high peaks of Ruwenzori.

Since the dawn of history the waters of the Nile have supported a thriving population in Egypt, although the country is hemmed in by deserts on either side, and the annual flood has given rise to speculations often fantastic as to the origin of the river and its water. The source of the Blue Nile first became known to the world outside Abyssinia in the 17th century, when it was discovered by a Portuguese, but it was not until the second half of last century that the sources of the White Nile were found, and the relative importance of the contributions of these two main branches was settled only at the beginning of this century. The favourable conditions produced by the annual inundation of the land of Egypt early produced a highly organised civilisation, and it is not surprising that records of the level of the flood were kept in very early times. Some of the earliest of these are recorded on the rocks of the cataracts, notably at Semna, south of Wadi-Halfa, where the river has eaten through a rock barrier on which, about 1800 B.C., a number of high-water marks were cut. Nilometers were established in various places along the river in early times, and the Roda Nilometer in Cairo, first erected about 620 A.D., still exists and has been in continuous use, except during reconstructions and repairs, until the last century, when readings on a modern gauge began. Not all the records have come down to us and there are many gaps, but an almost complete sequence dating from 622 A.D. to 1470 A.D. has survived to form perhaps the longest series of records now in existence of an important meteorological phenomenon. The originals have unfortunately disappeared, but copies have been handed down by various Arab writers. It is possible that the originals or parts of them may still exist, and should they some day be discovered it will be a remarkable find.

The Nile Basin. The figures enclosed in circles show the average annual discharge in milliards of cubic metres.

These Nile flood records have been analysed for periodicities, and some of relatively small amplitude have been discovered, but they are so obscured by greater irregular fluctuations as to be of theoretical interest only. The interesting fact which emerges from the records is the persistence over periods of as much as fifty years of sequences of floods which are on the whole above or below the general average. For example, in the period 1870 to 1900 one flood out of two was as high or higher than the highest flood since 1900. The finding of the cause of these sequences is more important than the discovery of periodicities of small and variable amplitudes.

The water supply of the Nile comes almost entirely from two areas, Abyssinia and the high country of Central Africa. From Abyssinia come the waters of the Atbara, Blue Nile, and most of the Sobat, while the

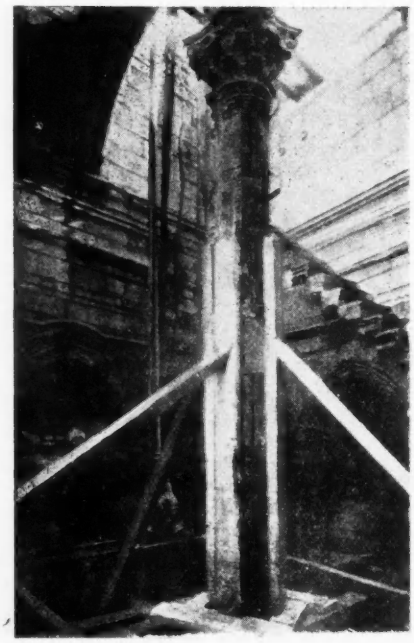
White Nile water, except for the contribution of the Sobat, comes from Central Africa. A river has many sources, but what is usually called the source of the Blue Nile is a spring at an altitude of 9,000 feet from which a small stream called the Little Abbai flows down to Lake Tana. The area of this lake is about 1,200 square miles and its overflow provides about one-eighteenth of the Blue Nile supply reckoned at Khartoum. Below Lake Tana the Blue Nile soon descends into a great canyon through which it flows for 500 miles before it reaches the Sudan frontier. This portion of its course is still one of the least known parts of the Nile Basin, and here it receives numerous torrential tributaries which have cut great ravines for themselves, making the country one of the most difficult to traverse in the whole of Africa.

A project which is arousing interest at the present time has been devised for the conversion of Lake Tana into a reservoir by means of a dam at its outlet. The water would be held up during the rainy season and released when the Blue Nile is low, for the benefit of cultivation in Egypt and the Sudan.

The average quantity of water which will be available from a Lake Tana reservoir for division between Egypt and the Sudan is estimated to be about 2.7 per cent. of the total supply of the Nile as measured at Aswan in Egypt.

Recently it has been stated that the Blue Nile itself could be diverted in Abyssinia so that Egypt and the Sudan would be deprived of its waters and Egypt thereby become a desert. This same idea arose in the 11th century when it is said that a series of very low Niles caused the Egyptians to think that the Abyssinians had diverted the Nile. In order to remove any fears that this statement may arouse it may be said that it would be as easy to divert the Rhine at Basle across Switzerland into the Adriatic as the main stream of the Blue Nile away from the Sudan and Egypt. The rainfall of the Blue Nile basin falls mainly from June to September, though there are appreciable rains in March, April, and May, and in no month is there entire absence of rain over the whole basin. The result is that the Blue Nile is at its maximum in August when it normally discharges 490 million tons a day at Khartoum, after which it falls away to a discharge of 11 million tons a day in April. The Atbara is a similar stream but of about one-quarter the volume of the Blue Nile, with a negligible discharge during the period December to June.

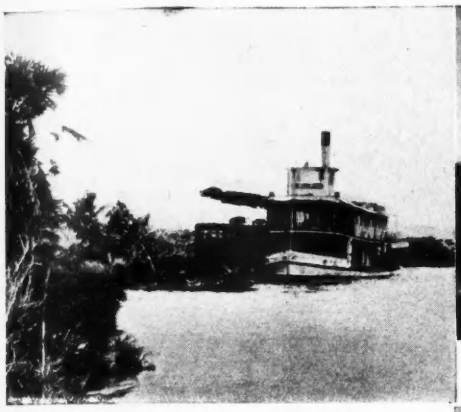
The Atbara and the Blue Nile when in flood bring down in suspension large quantities of silt from the Abyssinian plateau, the deposition of which through long ages has formed and is still forming the cultivable land of Egypt. As a slight counterbalance to the benefit derived from the silt its deposition in irrigation channels leads each year to serious expenditure for its removal. In consequence study has been devoted to the physics of the suspension and deposition of silt, but the subject is not yet well enough understood to allow of the reduction of the cost of silt clearance to a minimum.



The Roda Nilometer, Cairo (under repair). The scale is visible on the central pillar.

In contrast with the Blue Nile, the White Nile is a steady stream varying from about 45 to 120 million tons a day and contributing about half as much of the Nile supply as does the Blue Nile. This steadiness is due largely to the action of the swamps in the Southern Sudan, but partly also to the fact that some of its supply comes from the great lakes Victoria and Albert, and so only changes slowly. The swamps, which are known as the Sudd Region, are a remarkable feature and are produced mainly by the Bahr el-Jebel and the Bahr el-Ghazal; both of these streams are fringed by swamp with seasonally fluctuating boundaries.

The tributaries of the Sobat, Bahr el-Jebel, and Bahr el-Ghazal flow, after leaving the highlands, through a vast plain some 600 miles from east to west and 300 miles from north to south. All these streams are swamp-bordered and, as they wind their tortuous way through the plain, the rapid growing papyrus and tall grasses ultimately choke them and cause the water to overflow, thus further increasing the swampy area. Owing to the large annual fluctuation of flow of the Sobat, much of its swamp is dried up during the dry season, but the



Above: Papyrus on the Bahr el-Jebel.

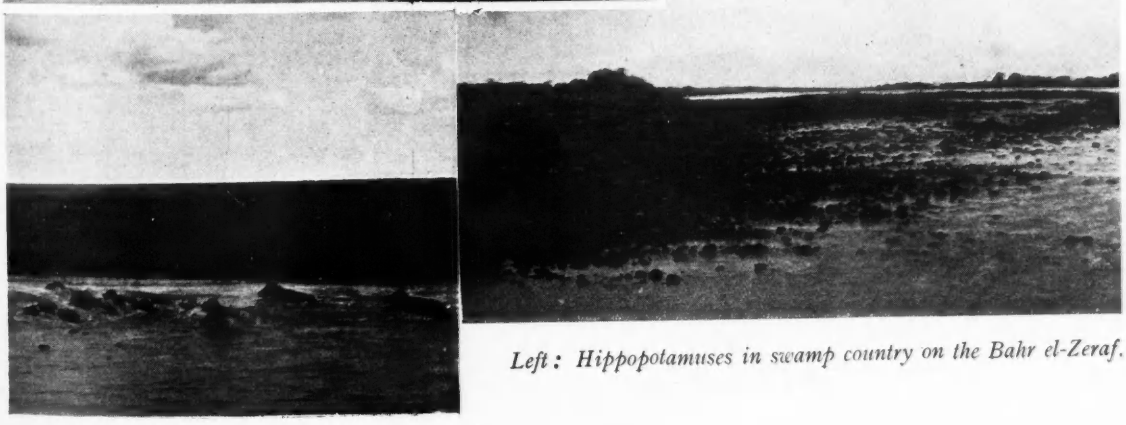
THE UPPER WATERS OF THE NILE

Lake Ruhonda, in Ruanda, one of the headwaters of the White Nile.

Right: The Ripon Falls, where the White Nile leaves Lake Victoria.

Left: Part of the cataract in flood by which the Blue Nile leaves Lake Tana.

Below: Part of the same cataract at low water.



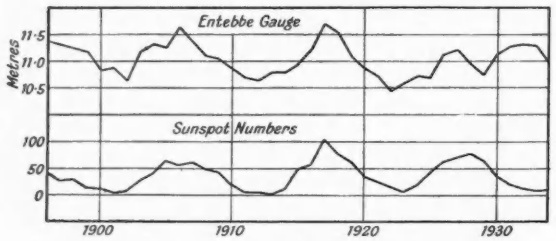
Left: Hippopotamuses in swamp country on the Bahr el-Zeraf.

Bahr el-Jebel and Bahr el-Ghazal both produce large areas of permanent swamp.

Outside the permanent swamp the plains are liable to be swampy in the rainy season, while in the dry season the same country is difficult to traverse for lack of water, and the population, both human and animal, is forced to concentrate on the shallow depressions which cross the plain, or on the edge of the permanent swamp where water and grazing are to be found. The people of these plains are of a primitive negro type whose life centres almost entirely round their cattle, while some even live on higher patches of ground in the permanent swamp, and depend on fishing or on hunting the hippopotamus.

The main feature of hydrology in the Southern Sudan is the enormous loss of water by evaporation. From Lake Rudolf in the east to French Equatorial Africa in the west the streams running down from the highlands to the plain lose most of their water by transpiration from the luxuriant vegetation which springs up immediately the rains start. Half the water of the Jebel and practically all the water of the Ghazal and its tributaries disappears in this manner.

The Bahr el-Jebel, five-sixths of whose supply is derived from Lakes Albert and Victoria, is not a very variable stream and consequently is in a different case from all the other tributaries, which are torrential.



Lake Victoria levels compared with sunspot numbers. The apparent connection between the two curves is seen to disappear completely in 1932.

Moreover, half its water does succeed in getting through the swamps so that it is obviously the first stream to study in order to devise schemes for water conservation, and a great deal of study has been devoted by the Egyptian Government to this river ever since the Sudan was reopened by the overthrow of the Khalifa.

Schemes for prevention of losses in the Sudd Region are closely linked with the scheme for a reservoir in Lake Albert by which the flow of the Bahr el-Jebel would be regulated so as to arrive in Egypt when it was wanted, and not when there was a great excess of water from the Abyssinian tributaries.

These large areas of permanent swamp are to be penetrated only along the waterways of the Jebel or Ghazal, which formerly were often completely blocked by vegetation; hence the name "Sudd" which is the Arabic word for a blockage. Now regular navigation tends to keep their channels open. Along the lower part of the Jebel the steamer travels for several days between walls of papyrus 12 feet or more high, and from the bridge one looks over a sea of vegetation, broken by an occasional lagoon or by some distant trees marking a spot of higher ground, while occasionally the backs of elephants show up in the vegetation, or a crocodile may be seen on the water's edge—a monotonous country, but not without interest for those who study it. Further south the papyrus gives place to grass and reeds and the edges of the valley begin to be defined by higher ground covered with thin forest. The width of swamp is less and the river winds about in it, approaching from time to time dry ground on one side or the other.

Importance of the Vegetation

The vegetation is puzzling to the casual observer, since under apparently similar conditions quite different plants predominate in different places. Thus, papyrus grows luxuriantly on the lower Bahr el-Jebel, while a short distance away up the Bahr el-Ghazal its growth is meagre. The great projects to enable the Bahr el-Jebel waters to pass through the region without undue waste, which will some day be executed, must obviously be based upon full information about the most striking feature of the country, namely the vegetation; otherwise there is the serious danger that although existing swamps may be eliminated, others may be created elsewhere.

Of the five-sixths of the Bahr el-Jebel water coming from Lake Albert, one-third is derived from streams running into Lake Albert (of which the principal is the Semliki) and the remainder from the Victoria Nile coming from Lake Victoria.

It has been said that the levels of these lakes are closely connected with sunspot activity, and up to 1923 when this idea was put forward their levels did appear to follow closely the sunspot numbers as can be seen from the diagram. Since that date, however, the connection has completely disappeared, and whereas in 1932 on this theory the lake should have been low it was actually at a maximum. Thus the relation between lake levels and sunspot activity must be looked upon as a chance relation which persisted for a time and has now disappeared like some other relations between meteorological phenomena which have been found to be transitory.*

West and south-west of Lake Victoria is the mountainous country of Ruanda-Urundi in which lie the sources of the Kagera river, the only tributary of Lake

Victoria of any importance, and in the same country rise streams feeding Lake Edward from which the Semliki flows down to Lake Albert. Knowledge of the hydrology of this region is scanty, but we may say that roughly the average discharge of the Kagera is 20 million tons a day and that of the Semliki into Lake Albert 15 million tons per day. Their flows were estimated by early travellers at much greater quantities, but it is curious that estimates of running water made by eye and not by measurement are almost invariably too high.

The Volcanoes of Ruanda.

In this country of Ruanda large amounts of water are transpired by swamp vegetation, as many of the valleys where one would expect to see running streams contain only swamps. It is a beautiful country at an average altitude of 5,000 or 6,000 feet, with a pleasant climate where at night a fire is very welcome. Among its features are beautiful mountain lakes and the chain of giant volcanoes, known as the Mufumbiro Mountains, which rise to 14,000 feet and of which two are from time to time still active. It is in the thick bamboo forest which covers a large part of these mountains that the gorilla is to be found, and a wide area lying between Lakes Edward and Kivu and including the volcanoes has been declared a sanctuary for all varieties of game.

Until recent times many parts of the Nile basin could be reached only after long and toilsome journeys on foot, accompanied by native porters. Now aeroplanes and motor roads have made it possible to see some of its main features without undue exertion. These facilities for travel make the study of the Nile much easier than it was when the pioneering work was done, but off the main routes there are large portions of its basin which are still primitive Africa out of which something new may come, which must be explored on foot, and where the discharge of the streams must be measured in dug-out canoes under the same difficult conditions as in the past.

In conclusion it is to be hoped that the study of the Nile, which has made great strides in recent years and which is so important for the welfare of Egypt, will continue to be prosecuted without being unduly fettered by utilitarian considerations, since the discoveries which have led to the greatest developments of our civilisation have usually been made in the pursuit of knowledge for its own sake.

(*continued from next column*)

for joint consideration by all the provinces affected, and not by each acting alone. Its urgency is such as to brook no delay.

The Native Emigration Problem.

A grave problem is discussed in the recent report of the Committee appointed by the Governor of Nyasaland to enquire into the conditions in which the natives of the Protectorate emigrate beyond its borders in search of employment. Up till 1935 labour recruiting had not been permitted in Nyasaland for twenty-five years; but the natives had been allowed to emigrate freely with a view to wage-earning abroad. The effects of this emigration were known to be serious. Not only did it cause the able-bodied population to be temporarily depleted, but it was known that a large number of the emigrants never returned. The investigations of the Committee, however, have shown that the effects were far more harmful than had been feared. It was found that "this uncontrolled and growing emigration brought misery and poverty to hundreds and thousands of families and that the waste of life, happiness, health, and wealth was colossal."

Unfortunately the problem to which the Nyasaland Committee directs attention is not confined to that Protectorate alone. Certain evils, mainly due to lack of system, which hitherto have affected the Nyasa natives adversely, such as the hardships of travel, unfavourable conditions of employment, low wages, and the like are remediable and likely to disappear as the new organisation under permit comes into full working. But the depletion of man power and the consequent social and economic dislocation are features common to all areas from which labour is recruited on a large scale. They seem inevitable under this system of manning industry. and are the effect of a system of taxation, which, indeed, was imposed originally with the aim *inter alia* of stimulating the native to work over and above the mere subsistence level. Hitherto the labour recruiting agencies have offered the easiest and most generally applicable fund from which the deficiency in the native individual or family budget might be met.

With the grave evils of expatriation in view, the question arises whether it is not possible to provide other sources from which the individual might provide against his obligations. The Nyasaland Committee indicates the development of cotton growing as a possible opening for the local labour supply; and an analogous development of natural resources might proffer an alternative to expatriation elsewhere. It is evident, however, that a number of subsidiary problems such as transport, markets and marketing, distribution and the like, arise, while the powerful interests of the labour market, and especially the mining industry, must not be ignored. The problem as a whole calls

(*continued in preceding column*)

The First Natives of South Africa.

By Captain G. A. Gardner.

The ruins of Zimbabwe, in Southern Rhodesia, have become familiar in word and picture; but the discovery of early Bantu remains across the Transvaal border, if less spectacular, seem more likely to lead to knowledge of the ancient peoples of Africa. Captain Gardner's position as Field Director of Excavations enables him to give DISCOVERY *the most recent report of this important work.*

READERS of DISCOVERY may recollect that some time ago there appeared in the *Illustrated London News* an account of the excavations at Mapungubwe in the Northern Transvaal, the text being supplied by Professor van Riet Lowe, Director of the newly-formed Archæological Bureau of S. Africa. Now this site, which lies on the southern bank of the Limpopo river, is of quite outstanding interest, for there, we have every reason to believe, has been unearthed the very first traces of Bantu culture in the Union, which can undoubtedly be linked up with the analogous civilisation in Rhodesia.

Perhaps a brief survey of the geological conditions and what has already been effected on the site may prove of interest.

It must be realised that the rock formation on the Limpopo and in the immediate vicinity is totally different to that appertaining to the Zimbabwe. On the Limpopo we have a soft cave sandstone, which, during countless ages, has been weathered by the action of wind and water into many isolated hills or mesas, often extremely difficult of ascent. This stone, in contradistinction to the granite of Zimbabwe, does not lend itself to the facile erection of walls, as it does not exfoliate in natural wedge-shaped blocks as does the older acid rock of Rhodesia.

The foregoing is to explain why on one site we have massive walls of granite, while on the other there are only low, badly constructed barriers of rough sandstone boulders. It is a question of geological adaptability and has really nothing to do with any one particular culture.

The Original South Africans

The Hill, Mapungubwe, was thoroughly explored by the well-known archæologists, Mr. Neville-Jones, from Rhodesia, and Mr. A. J. Schofield, from Natal, and they agree more or less upon the main points which may briefly be mentioned. Anthropological research has determined that the Bantu tribes now occupying S. Africa crossed the Zambesi in about the 11th or 12th century. It appears that the first tribes to enter South Africa were those of Sotho stock, that is to say, people whom we now include among the Basuto, the Bechuana, the Bapathling, and others. These were followed at different periods by tribes of other stocks who supplanted and often extinguished the original Sotho elements, but in some instances appear to have intermingled and lived peaceably among them. Such an instance is graphically illustrated at our site in the northern Transvaal.

Jones and Schofield have proved that at Mapungubwe there are two distinct cultures, one comparatively recent and the other of long duration. The former appears to have been merely an outpost or garrison of Shona stock which superimposed itself on, and amalgamated with, the original settlers of Sotho stock on the Hill and in the immediate vicinity of Mapungubwe.

During the winter of 1935 I had the honour to be appointed Field Director of the work which is under the ægis of the Pretoria University, who have an archæological committee consisting of various members and assisted by experts from the Witwatersrand University of Johannesburg. I arrived on the Limpopo in June, and it was at once apparent that very little had been left undone by my predecessors on the Hill itself; most of the excavations having been carried down to bedrock and the interesting gold ornaments and varied selection of pottery having been despatched to Pretoria. It behoved me, therefore, to look around.

A Huge Midden

About half-a-mile from my camp, under the Hill and on a small plateau, was a huge midden, and from the fragments of pottery, broken beads, and other evidences of human occupation, it was apparent that the place was worthy of investigation. My predecessors had already put down a test-pit or two, though no systematic exploration had been attempted, but it was quite plain that here was a spot giving evidence of a long occupational period, as the enormous mass of rubbish and debris could not have been accumulated in a comparatively few years. I notified Pretoria that I intended to explore this site as fully as time and finance permitted, and I received the "all clear" signal early in July. Labour was my difficulty, as naturally the natives are extremely raw, ignorant, and rather difficult to train. Instead of the short hoe of Egypt we had to use pickaxes, and it was almost impossible to extricate a pot whole or unchipped. However, under constant supervision, the natives worked well enough, but they never attained

Right: the first trench at Mapungubwe, with a pot still in situ. Left: a grave group, showing the type of Sotho pottery discovered.

to that uncanny sense displayed by the Gufti diggers of the Nile valley, who pride themselves on never breaking a pot under ordinary conditions.

The area of the site was so large and our time so limited that it was impossible to explore the whole of the ground thoroughly. I determined, therefore, to dig a trench through the mound or midden at its highest point, and, if time permitted, to put down a series of test-pits to discover if possible what lay on the outskirts of our midden.

The trench disclosed many interesting things. The mound at its highest point was 20 ft. from bedrock to the present surface, and was composed of loose ash and occupational debris, probably the sweepings of dwellings, as no traces of huts or settlements were found at or near its centre. This meant, as the test-pits proved, that the original inhabitants lived about the mound, and simply threw their daily refuse into the centre of the occupied area, with the natural result that the midden grew in volume as the years went by.

Now, I have stated that there were two cultures on the southern bank of the Limpopo and the older or Sotho culture was undoubtedly there for a very considerable period of time. The mound or midden under investigation is proved by its pottery, so far as we have progressed, to be entirely Sotho, and over a measured area the deposits total the enormous amount of roughly 40,000 tons. What has been washed away by water and dissipated by wind action is idle to speculate upon, but enough remains to convince anyone that the site was inhabited for a lengthy period.

It is essential here to point out the chief differences between the two cultures, that is to say, between the Sotho, who were the original settlers in the neighbourhood, and the Shona, who were the later or perhaps the military occupiers of the Hill which we call Mapungubwe. We will consider the more recent Shona first.

It is perfectly apparent to anyone that the Shona pottery differs greatly from that which preceded it. Schofield has ably classified the two, but I have neither time nor space to go fully into the details. It is, perhaps, only necessary to remark that the Shona ceramics are characterised by a very fine type of pottery, particularly shallow bowls and saucer-like utensils with accurately incised triangular decoration.

The skeletal remains, which are numerous and undoubtedly Bantu, show a great similarity of interment. The bodies are buried in a haphazard fashion with no particular orientation, and usually below the floor of a hut. They are sometimes flexed and sometimes extended, but invariably the whole skeleton is present. The metal body-ornaments are always of iron, consisting of a series of arm, leg, and neck rings, sometimes interspersed with beads, very similar to those seen on present-day natives. Glass beads, both wound and cane, are found in large quantities, and also the characteristic gold bead, both large and small, while gold bangles as well as totem and other articles have been unearthed.

Now, it is important to notice that these evidences of Shona culture are merely superficial, that is to say, they are not found at any great depth on Mapungubwe itself, nor are they found at all in the midden, which last season it was my good fortune to excavate.

This midden culture, which we call Sotho, differs, as has been said before, in nearly every respect from our Shona or Hill culture. The pottery is totally distinct. There is a much greater variety of form. In the Shona, low dishes and bowls predominate; in the midden we have spouted pots, beakers of all sizes, double compart-

ment dishes, pots with vertically-pierced lugs, and although the general decorative motif is the incision, it is quite different on those vessels we term Sotho. It is noteworthy that up to the present no trace of iron has been found in the midden. Copper in abundance has been unearthed, both in the form of bracelets for the arm and solid leg bangles ; ornaments of hard wood and ivory are common, and numerous bone points worn smooth by use occur throughout the excavations.

Sotho Burial Customs

It must be remembered that time only allowed me to drive a large trench through the centre of the midden and to put down a test-pit or two on its outer boundaries. The test-pits on the edge of the plateau disclosed the fact that huts had been grouped in a rough circle round this central midden, but as time was so limited I did no more than unearth a few hut foundations and floors. The wooden posts of the walls had completely perished and were traceable only by the discoloured ground where the shafts had once been. Before I conclude my brief survey of the midden it is necessary to mention the human burials that were uncovered in or near the mound. It has been stated that the Shona burials were sometimes contracted and sometimes unflexed, and that iron ornaments were found associated with the bodies. Our Sotho interments appear of a totally different character. In five out of six burials discovered during the cutting of the big trench, the bones were in every case completely disarticulated and many were missing. The interments were curiously similar, and may be briefly described as follows : The human remains—legs, arms, and ribs—were placed in a rough heap and surmounted by the skull, invariably broken and detached in every case from the lower jaw. In four out of five burials ox or cow bones were found in association with the human remains, and the whole was surrounded by a rough circle of pots or sherds, these again being encircled by a ring of small stones.

It is, of course, known to anthropologists that some primitive tribes have a ceremonial re-interment, and it appears as if the midden burials were of a similar type.

In conclusion I may be permitted to remark that the exploration of the huge midden is only in its initial stage. Much more remains to be done, particularly to explore fully the surrounding occupational area, which, last season, was only scratched.

The Archæological Committee of the University of Pretoria is to be congratulated on its enterprise, and it is sincerely to be hoped that further investigation may be undertaken, so that the early history and cultures of our Bantu races may be more clearly elucidated.

Zimbabwe.

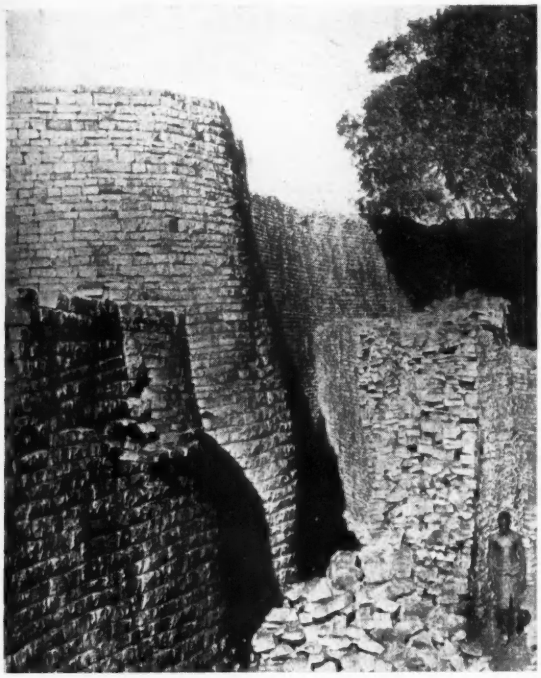
The massive granite ruins of Zimbabwe are probably coeval with the remains described in the preceding article. It is now generally agreed that they are of Bantu workmanship ; but, granting that, we still have to account for the extinction of the culture that raised them.

HALF an hour's drive along a good motor road from the township of Fort Victoria, in Southern Rhodesia, takes you to one of the most interesting riddles of history. It is Great Zimbabwe, a name given to three adjacent groups of granite ruins. There are hundreds of somewhat similar ruins about the Colony but all are smaller, and generally inferior, to their prototype near Fort Victoria. Possibly they are imitations.

The most imposing of the Zimbabwe group is the " Elliptical Temple," so called from the shape of its enormous walls and parallel passages, and from certain internal structures that suggest altars and a complicated religious ritual. Its purpose, however, is a matter of conjecture. It has been claimed as a shrine of the Goddess Astarte, as the palace of a king, as Zoroastrian " Towers of Silence," and even as a super-kraal for cattle. Near to it, on a steep and isolated hill, stands the " Acropolis." This, with its fantastically intricate battlements, labyrinthine passages and castellated ramparts was almost certainly a fort or citadel. It, too, contains smaller copies of the great " Temple " over which it towers. The Acropolis contains its own peculiar mystery. How did the garrison, which must have been very numerous, obtain water ? The only supply is *outside* the walls. The third item of the group, now little more than heaps of jumbled stone over circular foundations, is the ruin of a once populous city.

There can be no doubt that the inhabitants of this

The higher parapet of the Zimbabwe Acropolis



The ruins of the Elliptical Temple at Zimbabwe. On the left, a section of the labyrinthine "parallel passages"; on the right, one of the conical towers which are a characteristic feature of the remains.

forgotten metropolis built the fortress for their protection. Possibly, too, it was to the glory of their gods that they raised beside it, with wonderful artistry, the roofless, elliptical enclosure of cut stone. Who were the builders of Zimbabwe? Whence did they come, and when? Whither did they go, and why? What gods did they worship? Against whom did they so laboriously fortify themselves? To these questions there is as yet no satisfactory answer.

The careful investigations of Miss Caton-Thompson date the building of Zimbabwe not much earlier than about the time of the Norman Conquest and suggest that the builders were Bantu. If the latter conception is true—and this learned lady leaves little room for doubt that African natives at least supplied the labour—how came it that they suddenly developed a taste in elaborate and massive architecture and then entirely forgot it? Why, after learning the use of cut stone, did they return again to their mud huts of to-day? How is it they have not retained even a tradition to explain Zimbabwe or any trace of the Zimbabwe ritual in their customs? The builders of Zimbabwe left no written or graven word behind, so presumably they could not write.

There is another problem in Southern Rhodesia which may, or may not, be allied to Zimbabwe and therefore help to suggest a clue. The country is dotted with ancient gold mines, some of them going to considerable depth in the solid rock and exhibiting far greater skill than was at the command of the savage Bantu. It cannot, however, be assumed that the builders of Zimbabwe were the workers of these mines, for the ruins and the ancient mines are in no place grouped together.

The riddles of Zimbabwe still form a fascinating puzzle for the historian, the archæologist, and even the casual tourist.

R.M.S. "Queen Mary" Exhibit

The special exhibit of the R.M.S. *Queen Mary*, the greatest achievement of British shipbuilding, in the Science Museum, South Kensington, will remain open until July 12th, to mark the vessel's maiden voyage from Southampton to New York. The central feature will be a magnificent 22-ft. model of the vessel, which has been lent by Cunard White Star Limited. A collection of photographs will also be exhibited, showing the vessel at various stages of her construction, the launching, and technical details and views of the interior of the ship.

Unsolved Secrets of the Termites

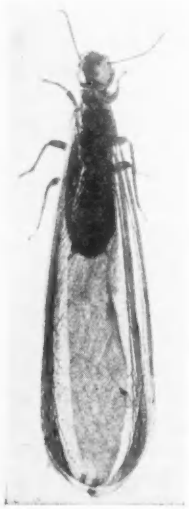
By Eugene N. Marais.

Translated from the Afrikaans by Winifred de Kok, M.R.C.S., L.R.C.P.

The white ant, or termite, has been regarded mainly in the character of a devouring plague and a destroyer of wood and other cellulose products. The late Eugene Marais treated this insect more sympathetically in his book THE SOUL OF THE WHITE ANT, *a brilliant exposition of animal behaviour. Our article is adapted from some of the chapters of Dr. de Kok's English translation of this volume.*

THERE is much to be told about the building of a termitary, but I will confine myself here to some of the mysteries of the builders' behaviour which are important for purposes of comparison.

Upon the king and queen termite, after their nuptial flight, falls the task of feeding and attending to the first children. After the latter are full grown they take upon themselves all the work of the community. In the meantime the queen grows larger and fatter by the hour. Her small neat body vanishes in increasing layers of fat until at last it becomes an unsightly wormlike bag. And, to heighten the tragedy, her mate, in addition to having the blessing of the only *dolce far niente* existence known to Nature, appears to have discovered the secret of eternal youth. He remains as beautiful and active and young as he was on his wedding flight. But if you look at her, an immovable disgusting worm, it seems impossible to believe that she ever fluttered in the air on fairy wings. We could hardly blame his majesty if he began casting an eye at some other female a little less repellent. If you fear this, however, you will be pleasantly surprised. His attachment to his queen seems to keep pace with her growth. If you lay open the palace cavity, he rushes round in consternation, but always returns to her side. There is no question of saving his own life in flight. He clings to her gigantic body and tries to defend it, and if the ruthless attacker so wills it, he dies at her side. What a wonderful example of married love and fidelity, which can survive this terrible change of his beloved to a loathsome mass of fat!



Winged reproductive form of a typical termite.

We often speak metaphorically of a queen as the mother of her people. This the termite queen is literally. She is the only mother of the countless millions which form the community, every individual is born out of her. Naturally she is absolved from all duty in the nursery. All she is expected to do is to keep on laying an endless stream of eggs, because the daily loss of workers and soldiers is enormous notwithstanding their excellent methods of defence. Mother Nature is not perturbed about the death of a thousand individuals, when she has had the foresight to make certain of an unending supply.

"Soldier" form of the same species of termite, without wings.

I am now coming to a stage when in actuality every termitary differs in its growth, but for our purpose we will suppose that the environment of our nest has been such that development is entirely normal and not subjected to any disturbing outside influences. The first workers begin to build a palace for the queen. From three to six feet below the surface of the earth they prepare a hollow chamber. As years go by this is gradually increased in size and the earth which is excavated is taken to the surface and used to form the thick defensive crust. In this hollow chamber the queen is placed. It fits her so well that one is inclined to think that it has been built around her. I do not think this actually happens, but now I come to a stage when almost every conclusion is bound to be mere guesswork. No human eye has ever seen what actually takes place. No one has ever discovered a way in which to watch the termites at work in the queen's chamber, for they work in pitch darkness and to let light into the chamber is as great a handicap to the termites as the sudden destruction of the sun would be to us.

The queen continues growing until, compared with the ordinary termite, she reaches a gigantic size, and becomes an immobile mass, still as a log. The only part of her which gives any sign of life is the little ant-like head which remains unchanged. If you dissect the skin and body carefully and examine it under a microscope with high-power lens, you will be convinced that during her later stages of growth the queen is unable to make any voluntary movement, except of course of the head.

You may think she could move like some worms, by contraction and expansion. But you will find that no part of the body behind the head can be controlled by what was once an intricate central nervous system. Nor do I think that there can be any question of her regaining the power of movement temporarily, as for instance by emptying the sac for a while. I certainly have seen no indication of this. Besides, the very nerves in the body have changed into fluid. Both these theories, therefore, that the queen is able to move by contraction and expansion, or that she gains a temporary power of movement, must be discarded.

To continue with the queen's life history, her first palace is a cell made of ant clay which rapidly becomes as hard as cement. Usually she just neatly fits into it. She is always much too huge to use the door of the cell as entrance or exit. If you wish to remove her you must break down the cell. The king and the workers, however, can come and go quite easily. She is fed and the eggs which she never ceases laying are removed to the breeding grounds by workers who are appointed to this task. The king apparently does nothing. He appears to be a mere hanger-on in the palace. Still the queen goes on growing. Here in her first palace she has not attained one third of her eventual size. At last she very nearly fills all the available space in the cell. There is barely room for the tiny workers to carry the eggs away across the enormous bulk. A terrible tragedy appears to be imminent—it reminds us of the question, what will happen if an irresistible force meets an immovable mass? The human observer is helpless at the threat of this terrible fate. In spite of all his knowledge and intelligence he is unable to help in any way. But actually the termites have never worried about it at all. They had a solution ready—a very simple one. Just before her majesty finally outgrows her cell they build a second one, half as big again as the first. It is parallel and adjacent to the first, just as hard and with just such a narrow door. The queen is then removed and placed in the second cell where there is space for her to grow for perhaps another year. So she gets transposed from cell to cell until there have been about six changes with the queen in the last and biggest. The chamber doors are always equally small—much too small for the queen to come or go by.

We must clearly establish another fact to make the whole matter even more complicated. One could easily prove by measurements that the queen's subjects could not possibly move her. The lifting power of one ant can be estimated fairly closely, and the area of the queen's body available for workers to grasp during lifting can be measured. During the later stages it would need thousands more ants to lift her than there is available grasping space for on the body. I present to you the following facts:—

Typical earthen mound built by termites.

1. The queen is incapable of movement.
2. The doors of the cell are too small for her to come or go by.
3. The ants cannot lift her.
4. Yet she vanishes from one cell to appear in another.

The only explanation that seems feasible is that there are several queens and that it is not the same one each time. If the first gets too big for her cell, she is killed and eaten and then the workers carry a potential queen into the second cell where she develops into a queen. The only intelligent explanation, it would seem? And very simple, now we have thought of it. The only pity is, it is not true. We have been deceived by remembering the bees, how they make queens and kill them and move them. It is quite an easy matter to mark the termite queen and so prove that it is the same queen that gets moved. I have tested many theories brought forward by friends who have studied entomology, but I have never found one which coincided with all the facts. Perhaps one day a future Fabre will discover the truth.

The Mystery of the Signals.

Shortly after she discards her wings, the flying queen sends a signal into the air, which is always answered by the appearance of a male flying through the air. What exactly the signal is I want to talk about now.

In order to understand the language of animals, one

must first of all learn its A B C, but of far more importance are the things to be unlearnt. An individual member of any animal race who wishes to communicate with another at a distance can use one of three things, colour, scent, or sound. And at this point you must begin unlearning. If you think of colour and scent and sound in terms of the impression which these make on a human being, then you will be lost before you begin your journey.

There is one kind of termite which constantly signals by means of sounds. If ever you have slept in a house in which those termites are at work you will know the sound well. It is a quick *tik-tik-tik*. You can also hear this if you let down a microphone through a hole made into an ant-hill. You will easily observe that not only do the termites make this noise, but that other termites at a distance hear it and immediately react to it by their behaviour.

Now catch one or more of the signallers and examine their anatomy under the microscope. What do you find? Not the least sign or suggestion of any kind of auditory organ; not even the most primitive kind of ear; not a single nerve that could possibly be sensitive to what we call sound. We find the same as regards colour and scent. The termites undoubtedly use both colour and scent for signalling, but they lack any organ resembling an eye. There is not the faintest spot of pigment which might serve as a primitive eye. The termites are quite blind and yet they are sensitive to an indirect ray of light far below the threshold of perception of the human eye. By this I mean they can become aware of a very diffuse light not shining directly on them, which a human eye could not perceive. This can be proved by experiment. As to any organ of smell, that, too, is completely absent.

The "Stinking Ant."

Our termites, however, continually make use of scents, some of which we can perceive with our olfactory organ. In the Northern Transvaal there is a well-known termite known as the "stinking ant"; this emits a foul smell to a distance of three or four yards, which has the peculiar property of causing extreme nausea in most people and also in dogs. Then again all South Africans will know the characteristic smell of the common termite. This is caused by the isolation of a certain gas which the termite uses for other purposes. It is of the utmost importance for us in our study of termite language to make certain of what the signal of the queen really consists. After long study, I have come to the conclusion that it consists of something which would affect our senses as *scent* if it were strong enough. Things always seem pretty hopeless in the beginning when we are dealing with phenomena which lie far beyond all our senses, but "perseverance pays" must be the motto of the traveller along these dark and unknown footpaths.

Here is another reason for thinking the signal may be thought of as scent. You can easily train a pointer to track down the flying ants after they have lost their wings. He will track down a signalling queen for nearly a hundred yards against the wind; with the male he finds it difficult even over the distance of a yard.

The following are all the signals used by the termite:—

1. The communal signal that is constantly sent out by the queen—who forms the hub of the nest—which serves to keep the community together and which enables every termite to recognise every other member of the community (this signal is one which cannot be perceived by our senses).
2. The call of the workers and soldiers. This is perceived by us as sound.
3. Food messages. (Beyond our perception.)
4. Lastly, the sexual signal of the queen, which is also beyond the reach of our senses.

As far as we can ever be certain—though never, of course, quite certain—we can say that the sexual signal of the termite queen is a wave circle in the air which in all probability would be perceived by our olfactory nerves as perfume if it could cross the threshold of our senses.

Correspondence.

THE FUTURE OF BRITISH INSECTS

To the Editor of DISCOVERY.

Sir,—"Some Other Entomologists," who write in your April number, may be interested to know that the Colorado Beetle is stated to have occurred at Liverpool in 1887 (see the map in Statens Växtskyddsanstalt, Flygblad No. 17, 1935, showing the various European ports, with the dates, where this insect has been found). It had occurred at Bremen the previous year (Riley, 9th Annual Report of the State Entomologist for Missouri 1877, p. 42). It may be to these occurrences that Tower in his work on "Evolution in Leptinotarsa," 1906, p. 36, refers when he says: "It was transported to Europe in 1875 or 1876, probably in the holds of vessels, appearing in England, Sweden, and Germany. . . ." What is probably the first official British warning relating to the danger of introducing this insect into this country was issued at this time by the Commissioners of Customs to their Outdoor Staff.

Other entomologists would surely be interested in the "available evidence" that the Cherry Fruit Fly will not survive the English climate.

It is not easy to obtain detailed information regarding the distribution, both in refuse dumps and indoors, of the House Cricket, but the writer had formed the opinion that that insect was now fairly general in both situations as far north as Lancashire and Yorkshire at least.

Yours faithfully,

F. L.

London, S.W.

Demon Dances in East Africa.

By Captain William Hichens,

late of the Intelligence and Political Services, East Africa.

Many problems of African psychology remain unsolved. Of these mysteries not the least is the condition of "demon-possession," which may even be collective, affecting a whole village. The exorcism dance which cures the possessed is a strange and thrilling ceremony, and the author has had the rare opportunity of witnessing such a scene.

Shungla ngoma, kizimwi akija !
On with the dance : the demon comes !
(*From the Tari song.*)

A CURIOUS outbreak of what the African calls *kupagawa na pepo, i.e.*, to be "ridden by demons" has occurred recently in Mombasa, Zanzibar, and other East African towns, almost in the form of a psychic epidemic. It appears to be linked with rumours of a *mumiani* or blood-drinking cult, some alleged members of which were publicly attacked in Mombasa last year, and with the reappearance of *milhoi*, *zimwi*, and other types of demons in various fishing villages.

To speak of these demons as though they actually exist, as Africans, of course, believe that they do, is to risk the retort that savages are prone to believe that sort of thing, but that it is, of course, a stupid superstitution, since demons "cannot" exist. Such a conclusion, however, is perhaps somewhat rash ; for savage beliefs are not always so fantastic as at first appears. The age-old Lango belief, which, long pre-dating Darwin, avers that the Lango's ancestors were tailed and hairy ; and the Masai belief, pre-dating Ross,[1] that mosquito-bite causes malaria, are but two of many instances of African "beliefs" which science can no longer dismiss as stupid superstitions. So, too, with *pepo*, or "demons" ; such curious manifestations as poltergeists, psychic traumatism, and similar "excitations," which as yet perplex our own psychologists, have not escaped the notice of the African ; and fantastic though his ideas of their causes and cures may seem, that is by no means to say that they are not based upon sound grounds. Be that as it may, *kupagawa na pepo* is a common and a very real calamity amongst African natives.

Each tribe has its special names for the spirits and demons which visit its kraals. On the coast the word *pepo* means "spirits" in general, but different kinds of spirits are distinguished, such as the *milhoi*, a one-armed, one-legged, one-eyed demon of stealthy habits and great malevolence ; the *mazoka*, which attacks men in the "bush" ; the *kinyambala*, haunting cross-roads ; the *rewa*, met in fruit-gardens, and the *zimwi*, usually found in fishing villages. Sometimes a large number of people are attacked simultaneously by the same *pepo*, or by a band of *pepo* of the same type. That occurred some little while ago at a fishing-village near Mombasa, when a *zimwi*, in the form of an old man in ancient Persian dress, caused much terror amongst the fishermen ; and again at Lindi, on the Tanganyika coast, where a band of *milhoi* visited a number of huts one night. On opening their hut doors several women choked with fright and died, and so many others fell into a state of "demon-frenzy" that my office, where their relatives brought them to report the matter, resembled an overcrowded lunatic asylum for some mornings afterwards. More often, however, the *pepo* are invisible and seize upon people as, all unawares, they go about their normal daily duties. Native market-places are particularly a haunt of *pepo*, and their victims are usually women.

[1]Burton found the same belief among the Somali, and refers to it as a "superstition" (*First Footsteps in East Africa*).

A Case of Demoniac Possession.

The wife and sister of my native clerk, Ali bin Raschid, were both attacked by *pepo* at a small market-place one morning. They were making some small purchase when Fatuma, Ali's wife, felt something pluck at her *kanga* or shawl. She readjusted the garment, whereat it was twice again twitched away. As no one was near, the women feared that it was the mischief of a *pepo*, and they hurried away towards their home ; but before they could arrive, Fatuma began to scream and was suddenly thrown violently to the ground by what, all the villagers agreed, was unmistakably a *pepo*. She was carried to her house where, a few minutes later, another *pepo* seized upon her sister-in-law, Ayesha. On this distressing news being brought to him, Ali sent hurriedly for a *mganga* or native doctor and an exorcism-dance was arranged.

It took place in the yard of Ali's house, a small compound walled in with *makuti*-thatch. In one corner the *mganga*, a shrewd-eyed elderly man, had lit a fire and over it brewed a large steaming earthen pot. Under the pent of the house his three assistants, seated on native beds, beat thunderously on large drums, while a score of the possessed women's friends and relatives lined the walls and shook rattles or banged furiously

with sticks upon kerosene-cans, until the small cramped yard rocked to a deafening din.

Meanwhile the women of the house had calmed the sufferers sufficiently to plaster their faces with scarlet clay and to bind their foreheads tightly with clay-smeared cloths. Wooden clubs were then thrust into their hands, circlets of large metal bells were clamped on their ankles and they were led forth by women friends into the middle of the compound. At once the din ceased and the *mganga's* drummers began a curious halting drum-beat, at first muffled but quickly growing louder and yet louder in a strange, jerky, compelling way like the beat of a throbbing pulse. The assembled natives began to stamp in time to this weird syncopation and the yard became a haze of noise and dust: but the two women stood stupidly immobile amidst it all, staring with blank, half-cunning animal glances, and twisted, drooping lips. Apart from the scarlet clay which masked them, the change in the faces of these girls, whom I knew well as modest and not uncomely women, was sufficiently horrible. Then, slowly, as the drumming swelled, they began to dance, falteringly, more vigorously, and, finally, frenziedly, until, screaming and shrieking, they flung themselves into paroxysms of stamping, leaping fury, beating at each other and upon their own limbs with their clubs, striking at any who chanced near, their wild cries, the crash of the bells on their ankles and the yells of the surrounding throng joining with the roaring drums into one demoniacal uproar.

A mass-exorcism of pepo-seized men in Tanganyika.

Above all rises the shrill falsetto of the *mganga*, chanting the exorcism songs, in words as weird as the scene. From time to time he drops handfuls of *dawa* or medicine into the pot and in a moment when the whole yard shudders with the noise, he dips a calabash into the pot and flings the steaming brew over the heads of the "possessed" women. The effect is startling. The drums stop dead; everyone stands mute. Only the two stricken women dance, their screams now a whimper. In a loud voice the *mganga* cries out, "What is thy name, O *pepo*? Rise up! Rise up!" The two women stop dancing as though turned to stone: they shudder and then throw back their heads, shrieking some unintelligible words, and then, with wild cries, collapse in huddled heaps upon the ground. The *mganga* splashes some brew over himself and his assistants, who begin to pack their drums. Friends carry the two women into the house and Ali comes over to offer me coffee and cigarettes. The *pepo* have been driven away.

The next morning I met these two women in the village, gay in bright clothes, their faces alight with smiles, gaily chatting as though nothing untoward had befallen them a few hours before.

For the different kinds of spirits different dances are held, each with its special dance-steps, drums, and songs. For the *bunde* demon, which is borne on a sound like the hoot of an owl and which seizes upon people returning home after dark, a horn known as a *pini* is needed. The horn is filled with fragments of aloe-wood, ambergris, gum copal, scented pandanus wood, jasmine root, and dog-basil; a dog's nose is added, and the horn is sealed with clay. The *mganga* waves this instrument over the stricken person with what seems to be a hypnotic influence.

Amongst some tribes a religious ritual of slaughtering a black sheep and an offering of parts of the carcase together with pots of beer upon the graves of ancestors is a preliminary to demon-dances; and in one Kenya tribe the curious practice exists of trapping the offending demon, when it is recognised as the restless spirit of some deceased relative, in a pot. A drum-dance is held at which the possessed victim is danced to exhaustion, but first a large earthen pot is set ready, with a lid, and clay to seal it; and into this pot is put a meal of what was the deceased ancestor's favourite food. At the point of the dance when the *mganga* gains control over the *pepo* he entices it to enter the pot to eat the food, whereupon the *mganga* claps on the lid, swiftly seals it with clay and the pot with its immured demon is buried in a swamp.

In nearly all demon-dances the doctor's aim is to make the spirit "mount" from the body of the patient into the latter's head and then to induce the *pepo* to "sit on the victim's shoulders," as the natives express it: the spirit is then in the doctor's power. He may drive it away or, as he often does, "receive" it into his own body, he being immune by his profession from its mischief.

Not all *pepo*, indeed, are regarded as malevolent and

while medicines are often taken to keep them away, such as concoctions of wild fig (*Ficus sycamorus*), other potions are taken to invite *pepo* to enter a person so as to help in some enterprise, or to compel *pepo* to "possess" an enemy or a rival in business or love. Cassia root figures largely in such potions. By special potions, kindly "spirits" can also be made to arouse a lady's affections in one's favour. These spirit-medicines are composed of roots, leaves, bark and berries known only to the *waganga*, who guard their secrets jealously and deliberately foist upon one spurious herbs when one tries to identify the native names of the real ones. But the medicines appear to be effective, since the natives who take them become "possessed" or "dispossessed" of *pepo* as the case may be.

The *waganga*, who specialise in *pepo*-exorcism, go through a special training. The art is at its highest in Pemba, the sister-island of Zanzibar, but the spirit-doctors' initiation is such a close-guarded mystery that no European, despite innumerable efforts, has discovered more than that the mystic rites are held in the forest at night when the *waganga* assemble naked. No human speech is allowed, except by a leader, all other communications being made by sounds like owls' hoots and dogs' barks.

In other tribes, as amongst the Njao, the would-be spirit-doctor, who must have what the African regards as a faculty for "seeing spirits"—we might term it clairvoyancy—which is by no means possessed by every native, is "admitted" to the cult when a large number of natives possessed of *pepo* have been got together. The candidate then comes before an experienced *mganga* who, opening the initiate's mouth, makes slits upon his tongue, which, of course, begins to bleed. A pot of special medicine has been prepared. In one tribe it is made of a vulture's beak and heart, a lion's heart and nose, the snout, heart, and tail of a hyæna, part of an elephant's trunk and numerous herbal ingredients which, having been reduced to ash in a potsherd, are then mixed with cock's blood and that of the candidate, who must then drink the mixture. Afterwards he is made to plunge into a river and there seek, under the water, the secret roots and plants for his exorcism medicines. A great dance is then held and the newly-made spirit-doctors proceed to exorcise the *pepo*, or, as they are called by some tribes, *alungu* or *tipo*, from the scores of demon-stricken people who have come in from kraals far and wide. Often numbers of natives amongst the throng of dancers become seized with *pepo* while dancing and swell the ranks of victims.

The women's heads were bound tightly with cloths, their faces were daubed with red clay, and they were given clubs with which they beat themselves.

Circlets of bells, clamped on their ankles, clashed as they danced.

The songs or chants sung at demon-dances usually make but little sense when translated; for instance,

Mshipe wangu wishagwia nyama:
Mchukua mchanga hana mfuga.
(My noose catches game by itself:
He who carries a child has no bones.)

but this is due to the fact that the spirit-doctors have a kind of code-language of their own and the words of the songs are mere disguises to hidden meanings.

Similarly, drinking potions of vultures' beaks and hyænas' snouts, and the not unamusing trick of trapping the demon in a pot, must be taken no more seriously than as fantastic ritual with which natives (and ourselves) are fond of surrounding ceremonies in order to

add to their impressiveness and mystery. But behind the veil of the fantastic is the concrete fact that seizure by spirits and demons of various kinds is a common calamity in the kraals and one which the demon-dance, with its " magic " brews, roar of drums, stamp of feet, and mystic songs, seldom, if ever, fails to cure.

Epilepsy, hysteria, and similar states have been suggested as explanations of this demon-stricken condition to which the African so readily falls victim : but anthropologists are now generally agreed that some deeper psychic factor is at work. It is difficult to conceive that, as in the case of the Lindi *milhoi*, a large number of householders should all be stricken with epilepsy on the same night, or that a healthy man, as often happens, should suddenly go into hysterics in his sleep or while he is calmly about his ordinary business. The African has a peculiar sensitivity to music and rhythm, almost hypnotically so ; and a similar psychic receptivity is not impossible. In any event, to the African the idea that a *pepo* could be a " disease " and not a spirit would seem absurd, since it is everyday knowledge that anyone, irrespective of sex, age, health, wealth, or social position, is liable to be seized by a *pepo*. In the kraals every hut has its charm to ward these spirits away and during the coastal *pepo* epidemic the palm-shrouded lanes of the fishing hamlets glimmered with the phosphorescent glow of fish-bones fixed to hut doors to protect householders from this curious malady to which science as yet gives no valid clue.

Mandates and Native Interests.

Throughout British Africa opinion adverse to any change in the present allocation of mandated territory continues to grow in strength and to find more emphatic modes of expression. While it tends to centre on Tanganyika, no doubt on account of the greater importance in that territory of the European interests involved, it should not be forgotten that arguments, which carry weight in the cases of Tanganyika and South-West Africa, apply with no less force to those parts of the Cameroons and Togoland which have been entrusted to British Administrations in West Africa. In this matter Britain is pledged to have regard first and above all to the interests of the native population. In the British, as well as in the French and Belgian mandated territories, native administration has been organised for the first time with the well-being of the native population as its first and main objective. The existing mandates are the only assurance of its continuance.

East and South African Views.

While the position taken up by the British Government must be understood in the light of Mr. Baldwin's reminder that decision rests ultimately with the Council of the League of Nations, opinion in Africa is not satisfied with assurances that no transfer of territory has been or is under consideration. It continues to be insistent in demanding some pronouncement which will commit the Government in regard to the future. In Tanganyika British subjects, European and other, consider the attitude of the Government " evasive " ; and Kenya has been no less strong in its expression of opinion. In South Africa the general attitude is unnambiguous. The Union Government has lavished money on South-West Africa and has come to regard it as an integral part of the Union, pending more formal assimilation. Views expressed in the Legislature have crystallised, and the Government, it is understood, has informed the British Government that in no circumstances will it consider the question of transferring the mandated territory of South-West Africa to another Power. So also in Southern Rhodesia. Mr. Huggins, the Prime Minister, in introducing the Budget on May 6th, said that the transfer of Tanganyika to Germany would be an absolute menace to Southern Rhodesia, Portuguese East Africa, and Northern Rhodesia.

Native Courts and Clinics.

It is interesting to note as of the greatest significance that in the same speech the Rhodesian Prime Minister, referring to native policy, said that the government wished to increase the native sense of responsibility, and with that end in view, proposed to introduce a Bill to establish native courts in order to give the natives more interest in the working of the reserves, and to allow them to try civil cases ; while the establishment of additional native clinics and hospitals, as well as schemes for improving the economic condition of the natives, had been decided, or were under consideration. Those who have watched the changing spirit in the adminstration of native affairs, especially in the southern half of the continent, during the last generation, will appreciate in the announcement of the Prime Minister of Southern Rhodesia the great advance in the relation between European and African which has been brought about in that period. This is due largely to the extension to nearly every part of the continent of those ideals which animated Lord Lugard, when he elaborated and introduced in West Africa his system of ' indirect rule.'

The Importance of Nigeria.

By B. J. Hurren.

Flourishing to-day, Nigeria may well be a corner-stone of the imperial structure before many years have passed. The development of air-routes has increased its accessibility, and Kano, the trade capital of the north, is looking forward to a period of rapid expansion.

NIGERIA is in the peculiar state of having both mandated and protectorate lands within its boundaries. The strip of the Cameroons on the east is a mandated territory, and the remainder of the colony is a protectorate.

Nigeria may be divided roughly into two parts. The south is low-lying and over-watered by the great Niger River, and is backward in almost every way. The north, which was formerly under the influence of the Tuareg, is much more civilised and progressive, and has several important industries.

Kano is the trade capital of the northern section, and its significance derives from the fact that it is on the main trade route across the Sahara to Algiers and Tunis. It is two days' rail journey north from Lagos on the coast, and is the seat of the Emir of Kano. It has a population of 67,000, and some idea of its size may be gathered from the fact that its city walls of mud are 14 miles in circumference.

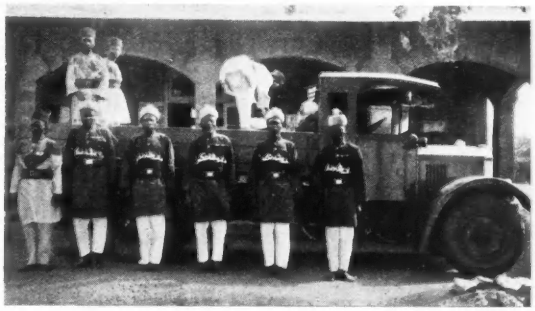
Into Kano the Tuareg still bring their camel trains, though an ever-extending network of good macadamised roads is increasingly introducing the use of motor transport. Indeed, in view of the long trip to Lagos and the circuitous sea-route to be followed by those going home to England, it is now a matter of personal preference whether that journey is undertaken or a crossing of the desert by car to Algiers is made. Incidentally there is an omnibus from Kano to Algiers, a matter of approximately 1,700 miles. The bus runs once monthly !

Quite recently the Kano aerodrome was opened, and is now the limit of the Imperial Airways service. The journey to England takes five days, via Khartoum, and rapid progress is being made in the building of an aerodrome at Lagos. The importance of these and other contemplated landing grounds may be emphasised by the fact that in the surrounding French territory there are approximately 200 aerodromes. Imperial air development is sadly overdue in this colony.

The chief industry in Kano is cloth, followed closely by leather. The natives are remarkably skilful with the latter, which is in turn linked up with an important secondary industry of dyeing. The local dye-works produce an attractive deep blue dye which is of excellent durability.

Monday is cattle day in Kano. From all quarters cattle arrive, and some 300 head are despatched south by train to Lagos. Cattle prices run from 15*s*. to 35*s*. a head, and the only bar to a really large expansion of this trade is the absence of chilling processes for preservative purposes.

Everybody in Kano has a four-legged beast of some sort. A horse is valued at 30*s*. to £4, and a donkey makes a change of ownership for 3*s*. Lest these prices should seem low it must be remembered that the animals arrive from the Sahara routes in a terrible condition.



Kano policemen as escorts outside the Treasury. Silver alloy is the currency, with a note circulation. The old silver coin is being withdrawn.

As a result a month's grazing is required, if the beasts survive to enjoy this respite.

A large measure of self-government is encouraged in Kano. The natives run their own electric light plant and water services. They also provide social services. The policemen are mostly ex-soldiers, more respected for their past than their present uniform.

Education costs about 1*s*. a month, and since the trade and business (as well as the house-work) is carried on by the women, the men are able to devote themselves to the pursuit of the favourite and lucrative profession of the Law. Living for the native is, naturally, remarkably cheap. The kola nut, something like a large brazil-nut, is the popular equivalent in vitamins to a pound of steak, though the nut is very bitter to eat.

Nigeria as a whole doubles its importance with each decade. The new air route will add considerable moment to this movement. It has been whispered that should the Mediterranean route to the East ever become liable to hostile interference, then the alternative route from England to India would run via Nigeria and the Sudan. Such a route would establish Nigeria as an all-important colony, and even a slight acquaintance with the trend of modern politics will lead to the admission that it may be desirable to build up Nigeria now with an eye to the not very distant future.

The Evolution of Nature Photography.

By Douglas English.

Readers of " DISCOVERY *" owe a great debt to the nature photographer, and an account of his methods should be of prime importance to them. Mr. English is an old hand at the game and his description of the patient progress of the wild-life photographer has authority behind it as well as interest.*

The photography of animals is a specialised branch of portraiture, almost if not quite as old as photography itself, and evolved through successive improvements in apparatus and material. That this specialisation has been, broadly speaking, twofold, is due in part to the diversity of living creatures, and in part to the æsthetic predilections of the photographer.

The leading exponents of what is popularly termed "nature photography" have always tended to confine their work to a single group of animals—mammals, birds, fishes, reptiles, or invertebrates, as the case may be; but their eclecticism has not ended there. The nature photographer may aim at producing pictures which are pleasing by reason of their beauty, or thrilling by reason of their sensationalism. He may confine himself to record work of the most severe and scholastic kind, or he may amuse himself and his friends by photographing a monkey wearing a man's hat. His highest aspiration, however, and the one most difficult of attainment, is to secure both scientific and artistic value in the same photographic negative. A record of this kind implies that the author possesses a good knowledge not only of photographic technique, but also of the animal which he wishes to portray.

The technically perfect photograph would supply an exact transcript of all the infinitely subtle differences of light and shade which are reflected from the surfaces of the object photographed. Probably such a photograph has never been obtained, but, in a few photographs, certainly not more than a few out of many thousands, an approach to that perfection has been obtained, which is called "quality."

Subtleties of Reflection

In animal photography "quality" is of fundamental importance. Living integuments, such as the fur of living mammals, the plumage of living birds, and the scales on living butterflies' wings, present subtleties of reflection and gradation, which photography alone can record, but which, in the average photograph, are debased, if not altogether destroyed, almost as completely as in the museum specimen. A photograph of an animal, however, may have considerable claims to quality, and yet be unsatisfactory; for, to be classed as a *good* photograph, it must suggest some action, expression, or attitude which is characteristic of the subject.

One may define the characteristic actions, expressions, and attitudes of wild creatures as those actions, expressions, and attitudes which they adopt most frequently; but, though certain general tendencies may be observed to be prevalent in certain families, the "sitting up" or "begging" attitudes of the weasels for example, one must not lose sight of the possibility that these attitudes may be the most obvious rather than the most frequent ones. One cannot, without long and careful study, be sure of the most characteristic attitudes of one's own dog or cat, and one needs to be even more diffident in the case of species of which one can only secure casual and intermittent observations.

The technique of those who were successful among the early photographers of animals must necessarily have been of high order, since otherwise, with the primitive apparatus and difficult processes at their disposal, they could not have obtained successful results at all. For a long time, too, they were handicapped by a difficulty which, from the nature of their subjects, was an especially serious one, and that was the necessity for very prolonged exposures.

The Last of the Quaggas

It is always an invidious task to establish, or refute, claims to priority in pioneer work, but it may safely be said of nature photography, as has been said of photography as a whole, that "it is no one man's discovery, but the product of many brains and many years." It is known that some photographs of animals, taken, it is said, at our London Zoo, were exhibited in Paris about seventy-five years ago; and this would correspond with the date of the invention of the collodion process, which, though enormously faster than the preceding daguerreotype and calotype, was yet considerably slower than the gelatine dry plate, which came into commercial use some thirty years later. The use of a slow plate, like the wet collodion, meant that except in cases of what would nowadays be termed "sea and sky" illumination, photographic work had to be confined to subjects that might be reasonably expected to remain still until the exposure was completed; and this restricted animal photography,

to begin with, to domestic animals, or to caged wild animals which had become inured to the presence of human beings. Yet, even with this restriction, some interesting and valuable records were made. The last of the quaggas, for instance, was photographed at the London Zoo in 1870, some five years after the existence of quaggas as wild animals had ceased.

Between 1870 and 1880 the much quicker and handier "dry plate" was gradually being perfected, and old catalogues of the Royal Photographic Society's Exhibitions begin to show an increasing number of "animal" pictures. In 1881-1882 a North Countryman, the late William Green, was successfully photographing guillemots and gannets on the Farne Islands and Bass Rock; and, in 1886, he photographed the nest and young of the golden eagle.

During the eighties several other enthusiasts entered the field, and by 1914 there was hardly a civilised country in which nature photographers were not working in friendly rivalry and publishing their results in books and periodicals. The vast majority of these chose, naturally enough, the path of least resistance, and, using the lure of the nesting site as their sheet-anchor, specialised in the photography of birds. Various devices, the chief among them being the "hide," were, and are still resorted to, to enable the photographer to take his pictures at the nesting site, without the birds being aware of his presence at all, or unduly resenting it if they are aware of it.

In the case of land-birds, nesting at a comparatively low level, a "hide," which may consist of almost anything that is not too obtrusive, and is sufficiently large to hold both the operator and his camera, is generally constructed a day or two before photography is attempted. Sometimes circumstances render it necessary to make a "hide" for the camera alone, and to rely on the pull of a string, or an electrical device, for making the exposure. In these cases the operator must conceal himself, but at the same time keep the nest under observation, and risk the disturbances caused by changing the plates.

Constructing the Aerial "Hide"

In the case of birds that build on tree-tops, or other giddy heights, the operator and his camera must be at about the same elevation, or higher, and this often necessitates the cautious and gradual construction of an aerial "hide."

While the lure of the nest is the sheet anchor of the bird-photographer, he may at times take advantage of other opportunities, for families of birds, as well as individual birds, have their idiosyncrasies. Kingfishers, for example, have favourite fishing perches; a stonechat may return again and again to a particular sprig on a particular furze-bush; a thrush's stone anvil may be betrayed by the snail-shells round it; or a nuthatch's vice by nutshell fragments below. Bait, such as a meal-worm, may be pressed into service to entice a bird on to some particular twig which has been focussed beforehand. Something which influences the birds' movements has generally to be taken advantage of, whether it be the natural lure of the nest, or an artificial one such as meal-worm.

In the almost innumerable photographic bird-books that have been published, the necessity which has been forced on the photographer of concentrating his attention on the activities of some particular bird, or pair of birds, for hours at a time, has proved at least as fruitful as the taking of the photographs.

Practically the same principles apply to all branches of nature photography. The big-game photographer may take advantage of the tracks leading to a waterhole, or, as in the case of lions, for example, rely on the approach of his subject to some prearranged bait, and the use of a flashlight. The photographer of insects at large has similarly to note some situation to which his subject frequently resorts, or some burrow from which it often emerges.

The Wild-Life Film

Before the War the net of the nature-photographer had already been flung from the poles to the equator; and the powers that control the cinema had already realised that films showing pictures of big game would draw the public if they were sufficiently sensational. The vogue of these, good, bad, and indifferent—and their value generally varied inversely with their sensationalism,—was interrupted by the War itself, but secured a new lease of life afterwards, and, so long as cinema entertainments were silent, held its own.

It was not, however, in the wilds or in the studios that the influence of the cinematograph was to assert itself most profitably, but rather in the laboratories, where a new technique was evolved to meet the demands of commercial cinematography, and to turn to a profitable account the trick manœuvres of the "camerist" in contracting or expanding the dimensions of time and space. It was found possible, for example, to project highly magnified images of minute living organisms, and to control representations of living growth in such a way that the progress of weeks might be compressed into a few minutes, and *vice versa*. From an educational standpoint it would be difficult to overestimate the value of this controlled work, which should perhaps be dignified by the name of "biophotography."

British Fruit for Summer Drinks.

For the past few years the staff of the Fruit Products Department of the Long Ashton Research Station has been engaged in investigations on some forms of fruit products which can be prepared from the various kinds of hardy fruits grown commercially in this country. The ultimate objective of this work is to open up new outlets for fruit in addition to those already existing through the fresh fruit markets and the canning and jam industries. There is no reason why, if sufficiently attractive products are discovered capable of rivalling in popularity the squashes and other beverages made from citrus fruit, this movement should not lead in due course to a considerable increase in fruit culture in Great Britain.

In view of the wide and growing interest which this work has aroused, an opportunity of inspecting the results so far attained and sampling the products was afforded to a party of experts from food and beverage-producing firms, fruit-growers, officials of the Ministry of Agriculture, and others. The exhibits were staged in the laboratories of the Research Station, and comprised several sections :—

The Fruit Syrups section was of special interest in view of the immediate prospective demand for products of this type through the rapid development of milk bars during the summer. These syrups were prepared from all the kinds of fruits in common cultivation in this country. In each case they were of a high degree of clarity and perfectly sound in condition, although several had been held in store for as long as four years. Outstanding in general attractiveness were examples made from strawberries and loganberries. The syrups with the highest sugar contents were notable for the remarkably full retention of the natural flavour of the fruit.

Fruit Squashes, containing the pulp of the fruit, were analagous to the well-known orange and lemon squashes. The black currant squash was remarkable for its delicate flavour, fully characteristic at the same time of the fruit. The other samples, while clean on the palate and of varying degrees of attractiveness, had not retained to the same extent the typical flavour of the fruits from which they were made.

Promising Wines

Fruit wines included several two-year-old specimens which are now beginning to mature into promising wines. In most cases the fresh fruit flavour had disappeared, being replaced by a vinous character reminiscent of sherry in the case of the strawberry and of various other grape wines in other instances. The strawberry and loganberry wines were regarded as very attractive.

The range of variety of possible new liqueurs made with the various fruit products in combination with spirits is of the wildest character. As illustrations of what can be done from fruit products alone two liqueurs were exhibited. In both cases a spirit distilled from strawberry wine formed the basis, the added flavouring material in the one instance being loganberry syrup and in the other strawberry syrup. The specific gravity of each was adjusted to be slightly lower than that of Chartreuse and Benedictine. They demonstrated that a new range of flavours in liqueurs is provided by products of this order.

More New Exposure Meters.

Photo-electric exposure meters continue to appear on the market with bewildering frequency. The new Photoscop meter, by Ensign Ltd., has the advantage of others in one point, however.

A factor which adversely affects the efficiency of photo-electric meters is the difficulty of estimating how big a part light from the sky is playing in deflecting the needle. This meter sumounts this difficulty by having a mirror and an inclined cell, so that the light from the sky is cut down to a minimum, and the maximum of the light from the foreground falls directly on the cell. The light from the sky is confined to an angle of 20 degrees ; the foreground light falls, over an angle of 25 degrees, directly on the cell, while light outside this angle of 45 degrees, has little affect.

The meter also has the advantage that when the pointer representing the speed of the film is set, as long as the sensitive material is used there is only one adjustment to be made, which gives the stop or the exposure, whichever is variable. The film speeds are given in degrees on a separate folder, and the dial is calibrated from 14 to 28 ; the rating agreeing more or less with the Scheiner system.

The time scale is suitable for either still or ciné work, as red figures underneath the black shutter speeds show the standard ciné speeds from 8 to 96 frames per second.

A notable feature of the Prinsen photo-electric exposure-meter, handled by Sands, Hunter & Co., Ltd., is its small size. It is very simple in operation, having only one adjustment, a sliding scale which is moved up or down according to the H. and D. speed rating of the sensitive material. When the lens is presented at the subject to be photographed, the correct exposure is clearly indicated by following channels leading from the needle marked with the apertures to the time-scale.

The "Sixtus," the new Dalmeyer photo-electric exposure meter, measures only 2½ in. by 2 in. by 1 in. and is very handy. Two time-scales are given, one from 1/5 to 1/500 second, and the other from ½ second to 2 minutes. The latter is employed for artificial lighting and a supersensitive cell for these conditions is brought into action by depressing a button. The time-reading is transferred to an adjustment ring, scaled in Scheiner and Din. degrees, which gives the correct stop for any exposure from 4 minutes to 1/1000 second.

The March of Knowledge.

High Voltage.

The opening of a new High Voltage Laboratory at Queen Mary College, London, one of the few attached to a college in England, affords a new opportunity for an important branch of research. The study of nuclear physics, much in the air to-day, should thereby receive yet further attention in this country, which at the moment still lags behind America in the supply of high-voltage facilities. We read that Princeton University is likewise developing its high voltage apparatus by the installation of a cyclotron, which has proved the most satisfactory means of procuring the high-speed ions necessary for the study of nuclear transformations. Three or more similar installations are reported to be under construction in Russia.

Hay Fever Treatment.

St. Mary's Hospital, London, has for some time specialised in the treatment of asthma, hay fever, and cognate complaints; and its annual report states that a generous gift received last year has enabled them to construct a pollenarium, a building for the collection and examination of the various types of grass-pollen used for the treatment of hay fever. It is estimated that the 28 lbs. of pollen at present collected represent about 58×10^{16} separate grains.

Intensive Hay Production.

The installation of two large grass-driers and automatic balers on his Warwickshire farm by Mr. C. Higgs has resulted in a discovery that may put an end to the time-honoured practice of haymaking. Successive dressings of fertiliser allow the grass to be ready for cutting at regular intervals from the end of March, and the resulting dried grass is sufficient to keep the cattle supplied throughout the winter. The possibility thus opened up of restricting grass land to really suitable meadows with intensified production and allowing many acres of poor quality grazing to be turned over to the plough may work a revolution in British agriculture.

Colour-Blind Drivers.

The problem of the colour-blind driver, in these days of traffic-lights, is of increasing urgency. The *Scientific Monthly* reports an invention which should relieve them of much mental anguish. The device is of great simplicity, consisting of a sheet of red-transparent material attached to the windscreen and punched with holes which are filled with a green-transparent substance. A green light would thus appear as a dark circle with bright discs, and a red light would be bright with dark spots. It would be interesting to see the effect created by that magnificently British compromise, the yellow light.

Aerial Propulsion.

The successful evolutions of Mr. Clem Sohn, the "bird-man," at Hanworth aerodrome have brought the question of aerial propulsion into the limelight; so that the issue by the Science Museum, South Kensington, of a new *Handbook of the Collections Illustrating the Propulsion of Aircraft* (H.M. Stationery Office. 2*s.*, postage 3*d.*) is particularly apposite. Fully illustrated with contemporary prints and photographs, it describes the early proposals for the propulsion of aircraft, the introduction of the airscrew, the earliest aero-engines, the use of steam, compressed air, and electrical power, and the advent of the light internal combustion engine. A technical survey includes notes on the design of various types of aero-engines and a chapter on the recent development of the ignition-compression engine. It contains a catalogue of the relevant exhibits at the Science Museum, including recent additions.

The Great Trek.

The great herd of 3,000 reindeer which Canada has been moving from the Yukon to the east of the delta of the Mackenzie River is still on the move, although it has reached its journey's end. A *Birmingham Post* report states that it is now being migrated to ranges farther north for the summer months. This shift is being made in a leisurely manner, for the animals are approaching the fawning season and every care is being taken to see that the herd reaches its destination in the best condition. When the journey is done the animals will be herded into a sheltered valley with a plentiful supply of good grazing. The remarkable hardiness of the new-born fawns is a matter of comment among the reindeer station officials. A review of the book describing the Great Trek itself will appear in a later issue of DISCOVERY.

Gironde Ferry

An important link has been forged in the chain of European road-transport by the recent opening of the ferry across the mouth of the Gironde, from Royan to the Pointe de Grave, a distance of nearly five miles. For travellers approaching south-western France by the coast this will avoid the detour through Bordeaux, and a new route will be provided between Paris, Biarritz, and Spain. The ferry-boat will make at least three trips each way in winter, and seven, if required, in summer; it can accommodate 150 passengers and either 12 ordinary cars or six heavy lorries or motor-coaches.

Book Reviews.

Africa and the Africans.

The Social System of the Zulus. By EILEEN JENSEN KRIGE. (Longmans, Green: Johannesburg University of the Witwatersrand. 25*s.*)

Miss Krige has brought together from the literature as complete a record as possible of the details of social organisation among the Zulu people. Her book, however, is not a compilation in the generally accepted sense; it is rather an interpretation. Not only has she analysed, collated and classified the material from these records, but by her personal investigations among the people and by her enquiries among tribal authorities on tradition, she has rectified mistakes, supplied omissions, and clarified obscurities.

In its scope Miss Krige's book is comprehensive. She sketches briefly the history of the people—a matter of much moment for the development of Zulu society in recent times—and then goes on to deal with family and tribal organisation, economics, the life history of the individual, including initiation, marriage and family life, death ceremonies, etc., and closes with law and religion. The adequacy with which each topic is treated is worthy of high praise.

As is well known, the modern form of Zulu society is, to a certain degree, artificial, in the sense that it was the creation of one man, Shaka, who attained the royal power at the beginning of the nineteenth century. He consolidated the Zulu people, organising them in regiments and moulding them to be a fighting force with which he dominated the native peoples of South Africa. It is a mark of his political genius that he did this largely by adapting existing institutions and tendencies to his purpose. His regiments were nothing but the age classes common to most Bantu peoples, developed to their highest power. They still exist as a basis of social organisation, although their function vanished with the fall of Cetewayo and the end of the independent Zulu kingdom in the Zulu War of 1879.

As a contribution to the sociological literature of the native peoples of South Africa Miss Krige's book is of great value and interest to the social anthropologist. For the lay reader it is an intimate picture of the life of a brave and intelligent people. To many, however, it will convey a lesson in so far as it is a measure of the ready adaptability of the African under a firm rule along lines which are in accord with his traditions.

E. N. FALLAIZE

Conquests and Discoveries of Henry the Navigator: the Chronicles of Azurara. Edited by VIRGINIA DE CASTRO E ALMEIDA; translated by BERNARD MIALL. (Allen & Unwin. 10*s.* 6*d.*)

The late Marshal Lyautey was an appropriate choice as the writer of a preface to this book; the modern conqueror of Morocco pays a graceful compliment to his predecessor.

Gomes Eannes de Azurara, the writer of the chronicles here published was a fervent admirer of the Infante Dom Henrique, "the Navigator," but his presentation of that prince's character is a measured one. Prince Henry was at once a mediæval type—devout to the point of asceticism, chivalric, and enthusiastic—and one of the prime movers of the renaissance. With his brothers he refused the honour of knighthood without some knightly exploit to deserve it, and the capture of Ceuta, which is the subject of the first chronicle, was the direct outcome of the crusading spirit of the princes. But that was not enough for Henry. The ferment of the renaissance sent his spirit questing beyond Cape Bojador, and though his royal rank precluded him from essaying the hazardous voyage in person, it was his enthusiasm and determination that inspired the Portuguese sea-captains in their attempts. Little by little the Guinea Coast was explored; captives and spoils were brought home; and commercial ventures started. The second chronicle takes us as far as the discovery of Sierra Leone in 1448.

The straightforward and sometimes naïve descriptions of Azurara, taken from eye-witnesses of the events recorded, make vivid reading; and the matter-of-factness of many of the captains, treading where no white man had trodden before, may come as a surprise to some readers. The treatment of the natives, ruthless at first sight, is relieved by touches of humanity, and the comments on the negroes brought to Portugal show that African psychology has changed but little in 500 years. An interesting chapter deals with the people of the Canary Islands.

Over the whole series of exploits reigns the steadfast personality of the dogged, plain-living, half-English prince whom we call Henry the Navigator, directing and collating operations in his observatory at Sagres.

Livingstone. By D. C. SOMERVELL. (Duckworth. 2*s.* 6*d.*)

Livingstone, of immortal memory, is interesting as a man, and interesting from the work he did, for no man has done more to influence the history of the continent of Africa, not excepting Rhodes. The outstanding feature in his character is its single-mindedness. He was incapable of guile as of hesitation. He set himself to a path, with a characteristic blend of piety and common sense, and from it never diverged one inch; though he had, of course, all the qualities and defects of his race and type.

Livingstone was free from colour-prejudice, and expressed approval of the Portuguese custom of taking care of their half-breed children. But his single-mindedness was escorted by simple-mindedness, and his early comment on Angola, that "Nowhere else in Africa is there so much goodwill between Europeans and natives as here," was modified when he clashed with the Portuguese later on in Moçambique.

It is not easy for us to realise that Livingstone had no notion of the origin of malaria, though he fully appreciated the value of quinine. He had a good knowledge of the tsetse fly, but failed to connect either fly or mosquito with disease.

It was on *safari* on the Kasai valley that I first read Livingstone's account of that marvellous first journey of his over the very ground to Loanda, which made it so real and vivid to me, as I looked out and verified the accuracy of his descriptions. I was able, too, to appreciate several of his comments, among others, that he became so accustomed to the black skin, that he felt positively apologetic for the whiteness of his own—under his shirt. I noted, too, like him, that, at least in that healthy plateau of Angola, many of the natives reminded me of men I knew in England. I shared, too, his disappointment at the scarcity of game in that district.

There are two incidents in his later career that have given

rise to discussion, yet to me seem clear as crystal. First is the time when he resolved to continue on his programme although his medicine chest had been stolen. It has been suggested that he was contemplating suicide, or at least going to meet death half-way. How could anyone who appreciates his character even hint at the possibility that such a man should even contemplate an escape from life? True, he writes that, as a medical man, he felt under a sentence of death, but he was not the man to draw back for that reason. He valued his drugs, but did not suffer from the quinine-complex, to which most white men in Africa are slaves to-day; and, content to rely on native and Arab remedies, he lived to work in the bush for another six years.

The other incident is the arrival of Stanley. Yet, as the author points out, the occasion was of little moment to Livingstone, great though it was to Stanley. It was generally assumed, as an axiom, that he wanted to be rescued, that he would wish to return to England. Why should he? His wife was dead. His work was in Africa, and he knew he had not many years left for her service. The Stanley episode was to him useful as bringing some comforts that he had half forgotten, and it enabled him to recuperate so that, as Stanley records, this worn-out man of sixty looked as though he had not passed his fiftieth year. It is as well that he never returned, for had he done so, his last years would have been spent in misery. He would have fretted out that big heart of his in nostalgia for his Africa, who calls back her adopted children. So far was his end from inviting explanation, that any other end would have indeed called for debate.

MALCOLM BURR

Kenya: Contrasts and Problems. By L. S. B. LEAKEY. (Methuen. 7*s*. 6*d*.)

Professor Leakey writes of Kenya with authority, partly on account of his scientific standing, but largely because he is Kenyan born and bred. It is not to be expected that the son of a missionary, born in the highlands, brought up to speak Kikuyu from childhood, should sympathise with the attitude of the British settler who has invested capital in the country with the idea of making a home there, a home which he invariably tries to make resemble an English one as closely as possible. The customary insistence on wireless and golf is evidence of the author's thesis that the white man remains and will always remain a foreigner in tropical Africa.

For that is the crucial question. Even in those highlands how many generations can grow and flourish without repeated contact with their Mother Earth? What will be the ultimate effect of the altitude, which alone makes tropical life endurable for the majority of white men? Is it not very largely that altitude which is the cause of that touchiness, which one hears so constantly excused by the remark, "You must not mind that; he has been too long in Africa?" The author clearly states that, in his opinion, the effect of the white man's control so far has not been to inspire confidence in the controlled. This may be an unpleasant pill for our complaisance, but it is foolish to shut our eyes to founded criticism.

The book is uneven. The style in places descends into popular journalism. It is at its best when the author is discussing problems that he knows. He is not an optimist, for he holds the view that East Africa is in a period of pluvial decline, which leads to the inevitable conclusion that the country is not promising for the small man, but only for big firms and those who are not entirely dependent upon the produce of their farms.

The author's criticisms are, however, not always destructive. His views on the language question, on the too frequent changes of appointment of officials, on the narrow-mindedness of the older type of missionary, deserve careful consideration, as well as his words about native methods of agriculture, which, after all, are based upon millennia of experience. One of the greatest problems of the country is prostitution, and in Kenya the whole social and racial question is complicated by the presence of a very substantial Indian element.

The author has interesting observations on native medicine, reminding us that their methods have much that is based on common sense, and upon trial and error over long periods. It is from primitive tribes that kola and quinine have wormed their way into our pharmacopœia, and Africa may yet provide us with something new, even in this sphere. It is instructive to learn that when consumption began its ravages among them, the natives systematically observed a series of experiments in the search for a remedy by empirical methods, and settled upon zebra fat. This is remarkable, in view of the discoveries recently published by Metalnikov of the Pasteur Institute, that a fatty diet promotes the secretion of lipase, the ferment necessary to digest wax, by which the system can break down the protective envelope of the tubercle germ.

M.B.

Uganda. By H. B. THOMAS and ROBERT SCOTT. With an Introduction by Sir BERNARD BOURDILLON and a Foreword by Lord LUGARD. (Oxford Univ. Press. 15*s*.)

This comprehensive work is a detailed description of the Protectorate of Uganda. The geological, anthropological, and biological aspects are dealt with, as well as the official, administrative, and economic, while the interests of the tourist and sportsman are well catered for. It is not an official work, but based upon official material, and may be regarded as authoritative. It is well got up and extremely well illustrated.

Not the least interesting part is the Historical Retrospect, which includes the romantic story, now half-forgotten, of that queer, studious doctor, Emin Pasha, the German-Jew who was so much in the news forty years ago, and of his clash with the driving temperament of Stanley.

The chapter on public health paints a dreadful picture. A fearful proportion of the natives harbour one or more kinds of helminth, while venereal disease, yaws, or both, with leprosy, dysentery, and spirillum fever are general, to say nothing of plague, sleeping sickness, small-pox, and malaria. This black picture throws up in sharp contrast the splendid work done by the medical organisation. The most serious diseases are already well under control, and most of the graver troubles are social in character, and will pass when the moral and sanitary conditions of the people have made further progress along the road on which they are so well started. The natives now have confidence in the white man's medicine, and the most hopeful symptom of all is the fact that they themselves are becoming qualified, under a gradually rising standard, to be licensed as medical practitioners.

One great advantage of Uganda is that it is almost entirely native, so that there is the minimum of that conflict between first principles and vested interests which is the curse of most other African countries.

Ubena of the Rivers. By A. T. and G. M. Culwick. Introduction by Dr. L. H. Dudley Buxton. (Allen and Unwin. 16*s.*)

Because records of the life and customs of more or less remote native tribes are necessarily specialised in interest, the authors of such books as this usually receive proper credit for their research only in specialised anthropological publications. The lay Press often fails to distinguish between the really valuable contributions to our knowledge of little-known tribes and the superficial " impressions " of the traveller, based on a visit of a few weeks. The post-war years have seen a boom in travellers' tales ; and though the educated reader may be offended by their obvious superficiality and invariable facetiousness, the less literate reviewers, with a taste for adventure in foreign parts, have widely commended them to their readers. Thus books like *Ubena of the Rivers*, which have none of what publishers call " adventure interest," are at a disadvantage.

Apart from the late Dr. Alice Werner, whose understanding of the Bantu tribes was unequalled, few Europeans have had much intimate knowledge of these interesting peoples. We may, therefore, be indebted to Mr. and Mrs. Culwick for their picture of the daily life of a typical East African Bantu tribe. Their book has an interesting origin. In 1930 the chief of one of the Bena clans (about which this book is written) was attacked by a hippo while travelling in his canoe, and among the belongings which he lost was a history of his tribe and a record of certain Bena customs, written in Kiswahili. These he had spent many years in compiling. He decided to undertake the task again, however, though his official duties prevented his making much headway with it. Half of the history had been re-written when Mr. and Mrs. Culwick made the chief's acquaintance, and his own record forms the second chapter of the book.

It is a commonplace to say that Africa is in transition—so is almost every other continent in the world—but hitherto the African scene has been portrayed only by the outsider. Here is a record in which the natives themselves have directly co-operated.

Wild Life in South Africa. By H. A. Bryden. (Harrap. 15*s.*)

The author was first in the field in Cape Colony in 1876, and has been an active figure in sport and natural history, largely in South Africa, both in person and pen, for half a century ; so that this delightful book is welcome evidence that he is still going strong.

It is a thoroughly readable book, crammed with interesting anecdotes and observations. Almost every page is enough to start an old hunter on his reminiscences, but I will resist the temptation to quote. Mr. Bryden is a neo-lamarckian. His views on the excessive subdivision of African animals into races are sound. He points out the danger of overdoing this on relatively scanty material. The colour of the skin, so often the chief character, varies so much with individuals, with age, condition, locality, and above all, season, that a long series is required before an opinion can be pronounced with safety. Besides, the accumulation of a long series of hides in this country is difficult, more so than of a collection of horns. Mr. Bryden states that a good collection of skins of the roan antelope is badly wanted here for scientific study. I knew this when I was eating roan, but the hide is so thick, becomes so hard, and is so heavy, that when I had about half a dozen of them in Angola and Northern Rhodesia I was obliged to abandon them. Mr. Bryden is a survivor of the happy days of African sport, before the country was vulgarised by the motor car and the tripper. He gives us good news that the Boers themselves, who started slaughtering antelopes for their hides about 1860, have realised the danger, and are now preserving their fauna. They have been just in time to rescue the beautiful blesbok from extinction.

M.B.

Africa Answers Back. By H. H. Prince Akiki K. Nyabongo. (Routledge. 7*s.* 6*d.*)

In an introduction by Dr. William Lyon Phelps we are informed that the author of this book is a prince of the blood royal of a Central African kingdom, educated at Yale and Oxford, who has specialised in philosophy, psychology, metaphysics, and the history of religion. Even without this guarantee, the book bears for the anthropologist the hall mark of authenticity, although it is written in the form of a fictitious biography. Indeed so true is it in detail, that here and there it might have been annotated to the advantage of the layman.

A vivid picture is given of the old order in Uganda just coming into contact with Christianity and missionary influence, and of the development of the native mind under western education. In the end, when modern science has proved its superiority to the Christian religion in meeting native needs, we leave the hero enthroned as chief in place of his father, but compelled, at least in part, to revert to traditional ways while he matures his plans for reform.

The book is an interesting study of the varied reactions of the African mind to some of the different elements in western civilisation. Its one limitation is that it deals with the ruler and not with the masses and, therefore, does not touch many extremely important social and economic problems.

Mules and Men. By Zora Neale Hurston. (Kegan Paul. 12*s.* 6*d.*)

The investigation recorded in this volume comes near to fulfilling the ideal conditions desired by the anthropologist. It is a description of the lighter side of life in a Negro community in the southern United States by a member of the race, born in the town in which the investigation begins, and also a trained anthropologist. She was in search of folklore, and gathered a rich harvest, of which she here retails a selection in the form of stories, sermons, songs, and music. They show the Negro love of colour and appreciation of rhythm to advantage. The conversations as reported abound in humour and, not infrequently, a characteristic but unconscious irreverence. There are glimpses here and there of the darker, amoral side of Negro character—not without its lessons for the sociologist who is interested in the relation of the segregated Negro community to society at large in the United States.

In the second part of her book Miss Hurston records her experiences in gaining admission to the inner circles of Voodooism in New Orleans and describes in full detail the initiation ceremonies in which she took part to become an associate of several of the chief practitioners of black magic in this city. Such a first-hand account is of exceptional interest to the student of this remarkable cult. Miss Hurston says little of her own emotional reactions. Possibly these are reserved for later treatment.

My Pygmy and Negro Hosts. By PAUL SCHEBESTA. Translated from the German by GERALD GRIFFIN. (Hutchinson. 18*s.*)

The author of *Among Congo Pygmies* has produced a sequel, in which he records his further adventures—adventures in the anthropological sense—when in search of material for comparison with the pygmy peoples described in his earlier work. For while the Bambuti are the true pygmies, there are other peoples in the Congo area, notably in Ruanda and the Equatorial Province, who are obviously closely related to them in culture and physique, while others again are sufficiently near to merit the title of half-pygmies.

Although the study of the pygmies was Father Schebesta's main objective, the interest of his narrative in the present volume centres in his account of the many negro tribes with whom he came into contact on his journey. In the short time at his disposal he collected a remarkable amount of detailed information, all the more valuable in that most of these peoples have not been described previously. The salient factor in the social system everywhere is witchcraft. An interesting account is given of the kingship in Ruanda, which was abolished by the Belgian authorities very shortly after the author's visit. In many respects it resembles the kingship in Uganda as described by Roscoe. The remarkable position of the queen mother is especially noteworthy. Another feature in common with the Uganda culture is the resemblance in certain matters to Ancient Egypt.

Equatorial Dawn. By DOROTHY UNA RATCLIFFE (Eyre & Spottiswoode. 12*s.* 6*d.*)

Here is another book of travel impressions—the author claims no more for it—gained on a big-game camera-shooting trip through East and Central Africa, with an exit through the Sudan and Egypt. It is the form of a diary letter to the author's mother, and gives an excellent idea to stay-at-homes of the Africa of the moment. There is, as might be expected, no pretence at scientific investigation, but the author knows how to use her eyes as well as her pen. The result is an easy-running commentary on everyday African scenes, going nowhere much off the beaten track. Good roads have made this sort of book possible; soon they will make it impossible (as the author herself suggests) for they bring in their track the English and American influences that are ultimately fatal to native Africa. At several points in the book the speculation arises—no doubt an unprofitable one—what would have happened if the dominant colonising nation in Africa had been other than British?

Books on other Subjects.

The Book of Barra. Edited by JOHN LORNE CAMPBELL; with chapters by COMPTON MACKENZIE and CARL HJ. BORGSTROM. (Routledge. 15*s.*)

This illuminating volume is a useful corrective to the somewhat sickly diet on which readers of books about the Hebrides have been too often fed. The mist of romanticism that inevitably blurred the minds of previous writers on the western islands of Scotland is here entirely blown away; and we are treated instead to a well-documented description of the remote isle of Barra from the pens of writers covering the period 1549-1883. Mr. Compton Mackenzie adds a chapter on the Catholics of Barra, for whom remoteness has slightly tempered the blast of Calvinistic persecution; and Hr. Carl Borgstrom provides a most interesting appendix on the Norse place-names of the island. The story of the island is a lamentable account of maladministration of land, government neglect developing at times into oppression, and absentee landlordism. The gloom is relieved somewhat by the activities of the Gaelic Schools in the early 19th century, and by the tactful enquiries of the Crofters' Commission in 1883. In recent years the Congested Districts Board has laboured to good purpose.

The Editor contributes a note on the Literature of Barra, which may be said to begin with the Norse poet Ormr Barreyarskáld, though all his works are lost save two quotations. The traditional songs, poems, and stories in the Gaelic vernacular are the true literature of the island, which may be studied in Carmichael's *Carmina Gadelica* and Campbell's *Popular Tales of the Western Highlands*. Lists of the local fauna and flora have been compiled by the Edinburgh University Biological Society; and excellent photographs by the Editor and Margaret F. Shaw reveal the austere beauty of the island.

Foundations of Short Wave Therapy. By WOLFGANG HOLZER and EUGEN WEISSENBERG. Translated by JUSTINA WILSON and CHARLES DOWSE. (Hutchinson. 12*s.* 6*d.*)

This work consists of two sections, the first on the physics, the second on the therapeutics of short electro-magnetic waves. It is fortunate that both authors are experts in their respective departments of specialised study. The translation, too, is admirably done by two acknowledged specialists—the text is straightforward and all facts and formulæ are well elucidated.

Some excellent oscillographs are shown [cathode ray oscillograms] of damped and undamped waves, the latter being very fully dealt with. A clear distinction is drawn between ordinary diathermy currents and those induced in a condenser field, while the theory of the electric field is thoroughly treated and illustrated (pp. 56-73). The experimenter will find Table II of use, supplying the specific resistances of various biological specimens. A description of ionic clouds formed in electrolytes is given, with mention of the time limit for their dissipation.

A welcome feature throughout the work is the numbering of all formulæ, thus facilitating rapid reference. It appears that the dielectric constant is lower in the case of those organs having much fatty tissue and air-spaces such as the bones and lungs. This is of importance in short-wave technique, seeing that condensation is constantly varying the capacity of the tuned circuit. Optimum wavelength and specific resistance are given in Table IV, from which it is seen that the greatest amount of heat in blood (for example) would be induced by a wavelength of 3.1 metres.

Considering the biological effects of short-wave radiation, the author's remarks indicate its unique place in therapeutics: "The possibility of thermally influencing the interior of the smaller life particle—the cell . . . obviously suggests that we may expect to find in this manner some complex expression of life activity at the points under treatment which cannot be achieved by any other means." It is mentioned that the biological changes due to short waves are not due purely to any thermal effect, and the observations which Holzer puts forward show that the phenomena are wrapped up in certain colloidal

conditions according to his " Point Energy " idea. The kinetics of the thermal energy due to the short waves must be considered from the effects of surface-tension and such molecular re-arrangements as anomalous dispersion and dipole phenomena. Concluding the physical part of the work are particulars for operating the short-wave apparatus.

The second section of the book, by Dr. Weissenberg, deals with the therapeutic side of short-wave radiation. The first chapters are concerned with skin diseases and abscesses. Inflammation of different structures indicates that considerable benefit may be received from the application of short waves, and the author mentions that he has not observed " a single case in which the short-wave treatment ever had an injurious effect." Further remarks on the diminution of inflammation and rapid relief of pain in cases of rheumatism, tuberculosis (in which the local disease of the joints is a secondary feature) are of special interest to the clinician. The advantages of short-wave treatment is contrasted with that of diathermy in cases of acute infection.

The author has also an account of treatment of the heart and vascular system, and though no definite opinion can, as yet, be expressed on the efficacy of the short waves in gastro-intestinal diseases, yet the author believes that any hypersensitive condition of these parts can be benefited—his own case-reports show definite improvement.

The work closes with an excellent bibliography to both physical and medical sections. Such a volume should be in the hands of all research workers affected by the phenomena of high-frequency currents in biological fields. To the bio-physical assistant, physiotherapist, and technologist, the work will be found extremely valuable, while the medical man should derive benefit from the reports given in its medical section.

FRANK W. BRITTON.

Mechanistic Biology and Animal Behaviour. By THEODORE H. SAVORY. (Watts. 7*s*. 6*d*.)

In his writings upon the Arachnida Mr. Savory has expressed his views on animal behaviour, so his readers will not be surprised to find here a very clear account of the reflexes and tropisms which appear to govern animal movement, expressed in a literary style that makes it also a readable book.

He warns us against loose thinking, against the danger of " reification " of words, and talking of a tropism as though it were a thing. He quotes B. Russell, " most people would die rather than think, and in fact they usually do."

Of the twelve tropisms enumerated, the most closely studied has been phototropism, which gives us a glimpse into the machinery by which the others work. What makes the moth singe its wings ? The work of Loeb and Ewald upon the phototropic curvature of the hydroid *Eudendrium* shows that the behaviour of animals obeys that fundamental principle of photochemistry, known as the Bunsen-Roscoe Law, discovered as long ago as 1857-9, whereby the reaction of animals to illumination is proved dependent upon the wavelength of light. Hays Hammond constructed a " heliotropic dog," based upon the selenium cell, which would automatically follow a light, up to a speed of nearly 3½ miles an hour.

There is an immense field for study of tropisms. One day, no doubt, all animal behaviour will be explicable in mathematical terms, as has begun to be possible with phototropism. Crozier and Steer have shown that the planarian *Leptoplana variabilis* is negatively phototropic and kathodically galvanotropic. The planarian moves at an angle of 45° to the two stimuli when the current density is proportional to the logarithm of the intensity of illumination.

The two main conclusions reached by Loeb, after intensive experiment, are (i) that the movements of an animal are caused by the action of stimuli on its sense organs, and from them to its locomotion, and (ii) that the ensuing movements occur mechanically as a result of physical and chemical changes, with no effort on the part of the animal.

This applies to the " lower " animals. But where consciousness begins is another problem.

Recovering the Ancient Magic. By MAX FREEDOM LONG. (Rider. 12*s*. 6*d*.)

Mr. Long is an American traveller with a belief in magic that must be characterised as devout. His book describes beliefs and practices among the Polynesians and is a sustained, impassioned case for magic against the customary attitude of science towards wonders. Much of the book may interest the ethnologist, but the book stands or falls by its treatment of magic. By this Mr. Long means, " the system of practices which *results* in the production of effects entirely contrary to the present-day ' laws ' of science ; that body of practices using super-physical forces, or the aid of super-physical beings to accomplish physical results." His emphasis on *results* and his dig at " laws " help to show what is indeed the case, that he is no lip-server of magic but a real believer. Whether he will communicate his beliefs or even his enthusiasm to readers is another matter. He is bold enough to believe that the Hawaiian native practitioners can handle elemental spirits " like tame animals," and that by their traditional methods they have acquired great control over the sub-conscious. (They seem to be the Coués of the Antipodes.) He is on safer ground in relating this primitive magic to the Indian practices of Yoga and to some of the things with which American and European psychical researchers busy themselves to-day. Mr. Long writes enthusiastically, though, at times, too casually ; he is never dull ; he is never afraid to express his opinion plainly. But few who have been trained in science, or are in any way scientifically minded, will be convinced by the results of varying " evidential " value which he has collected for them.

Mr. Long's stories of magic have no scientific value because he rarely gives the salient facts in the evidence he relates. Thus, in the fire-walking feat, the important things are the effective surface temperature of the hot stones and the exact time (measured by a stop-watch—not exaggerated by the excited onlooker) of contact between the foot and the stones at each step. But these are not given. When Mr. Long found that other people, besides the natives, could do the feat with impunity, the explanation given is not the right one, namely, that there is nothing very wonderful about the feat at all, but, instead, that magic had been subtly conveyed by the adepts to these other people so that they, too, became immune.

Magic is the explanation of the ignoramus. To explain things on the physical plane, like fire-walking and the other wonders described by Mr. Long, by the *super*-natural is merely to bandy with words. For the natural is that which occurs ; if the feats described did occur then they are by that fact natural. It is the task of science to explain the natural. If it can, that is well. If it cannot, the thing to do is to extend science, not to fall back on that ignorance and paralysing credulity which are the staple of magic. Magic should be uncovered, not recovered.

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